S. 50

The Journal

OF THE

BOARD OF AGRICULTURE.

VOL. XIV.

(APRIL, 1907, TO MARCH, 1908.)

LONDON:

PRINTED FOR HIS MAJESTY'S STATIONERY OFFICE,

BY HARRISON & SONS, ST. MARTIN'S LANE, LONDON, W.C.,

AND PUBLISHED BY THE BOARD OF AGRICULTURE AND FISHERIES.

INDEX TO VOL. XIV.

(April, 1907, to March, 1908.)

[*NOTE.—References to Insects and Fungi are indexed under the headings "Insects" and "Fungi" only.*]

THE JOURNAL

OF THE

BOARD OF AGRICULTURE.

Vol. XIV. No. 1.

APRIL, 1907.

A NEW METHOD OF TREATING METEOROLOGICAL STATISTICS.

Some additional matter introduced into the Weekly Weather Report of the Meteorological Office at the commencement of the current year promises to be of considerable assistance in the comparison of agricultural and meteorological phenomena and in the tracing out of any connections which may be found to exist between them.

The statistical matter which the report has hitherto contained gives a summary of the week's weather in each of the twelve districts into which the British Isles are divided for meteorological purposes, under the separate headings temperature, rainfall, and sunshine. From the agricultural point of view the selection of the week as the unit of time has many advantages. The more usual unit of the month is found to be so long that many important details become obliterated. For instance, a month of average rainfall may be made up of one week of heavy rainfall and three weeks of absolute drought, and to the agriculturist such a month would be very different from one in which an equal rainfall is distributed evenly over the whole period. On the other hand, if daily values be made the basis of computation, the mass of figures becomes so large that it is difficult to deal with it in a comprehensive manner. By the adoption of the week as the working unit of time the figures are maintained within a reasonable compass, while, at the same time, the larger variations in the character of the weather find adequate expression.

The arrangement of the statistics in districts is intended to give values which shall be independent of purely local circum-

stances. The observations from an individual station are of very restricted application and in their details are only representative for a very small area, but, by combining the reports from a number of stations, values are obtained which may be looked upon as representative for a much larger region. The boundaries of the several districts are shown in the accompanying map (Fig. 1).

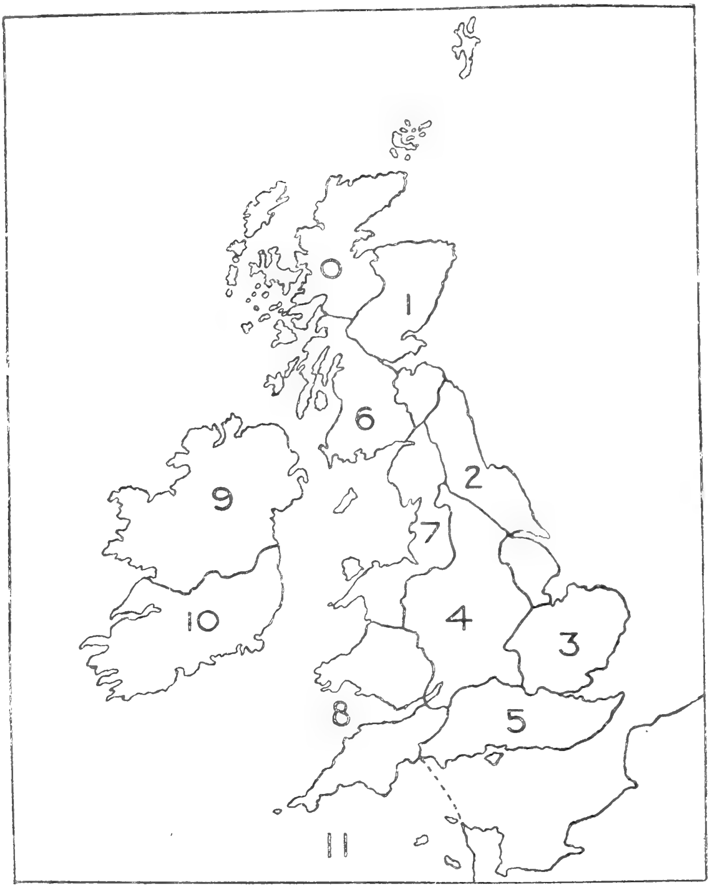


FIG. 1.

Each district contains a number of observing stations, varying from 11 in District 4, "Midland counties," to 5 in District 6, "Scotland West." (In District 11, "English Channel," which includes the Scilly Islands as well as the group of islands known as the Channel Islands, there are three stations). The stations are selected so as to be as far as possible uniformly distributed over the district and to represent the varying physical conditions

met with in it. The "district values" for the various meteorological elements considered are the arithmetic means of the values for stations in the district.

It may be objected that the mean value determined in this way does not represent the actual occurrence at any one point in a district, but experience has shown that the divergence of the various elements from their averages at the individual stations are, broadly speaking, of the same character as the concurrent divergence of the district value from its average, and, as a general rule, it is with the divergence from the average that we have to deal in examining statistically the effect of meteorological conditions on phenomena influenced by the weather. The values for individual stations are given on a separate page of the Weekly Weather Report.

A further advantage possessed by the method of working with values for districts is that it is possible to maintain the continuity of the records even if observations are discontinued at individual stations. The effect of the records from a single station on the mean for the district is small, and, by exercising judgment in the selection of the stations, it is possible that the whole series of stations in a district may become changed in course of time without materially altering the mean for the district.

It is a matter for great regret that the meteorological districts are not the same as the divisions of the country adopted by the Board of Agriculture. The consequence is that a direct comparison between the meteorological and agricultural statistics is not possible. A readjustment of the district boundaries is, however, not immediately practicable, as it would necessitate the recalculation of the averages for districts, and this would involve much labour. In the Weekly Weather Report the station values have been arranged, since the commencement of 1906, in a manner which allows of the calculation of values for sub-districts which can be combined to agree approximately with the divisions of the Board of Agriculture.

Accumulated Temperature.—Questions of warmth are dealt with in the Weekly Weather Report mainly on the basis of "accumulated temperature," and before discussing the recent additions to the report it will be desirable to give some explanation of this term. Accumulated temperature takes account

of the amount by which the temperature exceeds a given base temperature and the length of time during which the excess is maintained. The unit of measurement is the day-degree, a day-degree signifying 1° F. of excess above the base continued for 24 hours or any other number of degrees continued for an inversely proportional number of hours. As base temperature 42° F. is adopted, this being regarded as the limit above which temperature is mainly effective in promoting the growth of plants in a climate such as that of the British Isles.

The meaning of the term may be most easily understood from the diagram, Fig. 2, in which the central curve represents

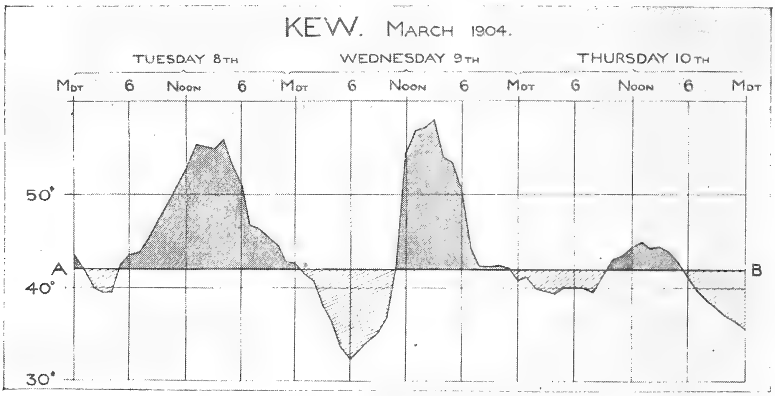


FIG. 2.

a thermograph record at Kew for a period of three days. The thickened line AB is the base line 42°. That portion of the area bounded by the thermometer record and the base line, which lies above the base line, represents the accumulated temperature above 42°. In the figure it has been shaded.

"Coldness" is estimated by accumulated temperature below 42°. The unit of measurement is, as before, the day-degree. In the figure the cross-ruled area lying below the base line and between it and the thermometer record represents accumulated temperature below 42°.

In practice the accumulated temperature above and below 42° is calculated, in accordance with a set of rules drawn up by Sir Richard Strachey, from readings of maximum and minimum thermometers taken once a day. These rules are given in the preface to the Weekly Weather Report; a full account

of the principles on which they are based will be found in Appendix II to the Quarterly Weather Report of the Meteorological Office for 1878.

The temperature conditions of a longer period may be summarised by adding the amounts of accumulated temperature above 42° or below 42° of the individual weeks which compose it, in the same manner as the amounts of rainfall and sunshine are added. Cumulative values from the commencement of the year to the end of each week, for each of the six elements, number of rain-days, total rainfall in inches, accumulated temperature above 42°, accumulated temperature below 42°, number of hours of bright sunshine, and the percentage of possible duration of bright sunshine, are published in an annual appendix to the Weekly Weather Report.

The Classification of a Week's Weather.—The additional matter recently introduced into the report consists in a description of the warmth, rainfall, and sunshine experienced during the week in each of the twelve meteorological districts, in the following form:—

—	Extreme N.	Eastern Section.				
	0. Scotland, N.	1. Scotland, E.	2. England, N.E.	3. England, E.	4. Midland Counties.	5. England, S.
Warmth ...	Deficient	Deficient	Moderate	Moderate	Moderate	Moderate
Rainfall ...	Heavy	Heavy	Moderate	Moderate	Moderate	Moderate
Sunshine ...	Moderate	Abundant	Abundant	Abundant	Moderate	Abundant

	Western Section.					Extreme S.
	6. Scotland, W.	7. England, N.W.	8. England, S.W.	9. Ireland, N.	10. Ireland, S.	11. English Channel.
Warmth ...	Moderate	Moderate	Moderate	Moderate	Unusual	Moderate
Rainfall ...	Heavy	Very Heavy	Moderate	Very Heavy	Moderate	Moderate
Sunshine ...	Moderate	Moderate	Scanty	Moderate	Scanty	Moderate

The meteorological characteristics of the current season and the past four seasons are summarised by enumerating the number of weeks of each kind which they contain.

The adjectives are to be understood as describing the divergence of the weekly values from the average "for the time of year." At first sight it might appear reasonable to regard all values as "moderate" which lie within a fixed limit of the average. Thus we might agree to call a week's rainfall moderate if it were within, say, 0·1 inch of the average for the time of year and to use the terms heavy or light if it differed from it by more than this amount. The following considerations however show that such a system would not give satisfactory results when the number of weeks of each kind in a lengthy period come to be enumerated.

If the rainfall statistics for past years be examined from the point of view of the frequency of occurrence of falls of given magnitude, the weekly totals are found to group themselves very unevenly with respect to their average. A single very heavy fall compensates for a large number of small falls with the result that the average is greater than the "median" or middlemost value when the falls are arranged in order of magnitude. The middlemost value of a group of numbers is to be understood as that which is so related that there are as many above it in magnitude as there are below it. We may say that in rainfall statistics, the middlemost value falls so that the chance that a value chosen at random is less than the average is considerably greater than the chance that it is above it. It is not correct to regard the average as "what we may expect," as is so often done implicitly, if not explicitly.

An example will make this point clear. For illustration we select the rainfall in District 3, "England East," during the 13 weeks which make up Spring (10th to 22nd weeks of the year). The statistics for 25 years give us $25 \times 13 = 325$ values of weekly rainfall within this period. If the frequency distribution of these be determined for gradations of 0·1 in., they group themselves as follows :—

161	20 weeks of Rainfall.			Zero.
	60 ,,	,,	between ...	0·0 and 0·1 inch.
	39 ,,	,,	,, ...	0·1 ,, 0·2 ,,
	42 ,,	,,	,, ...	0·2 ,, 0·3 ,,
164	30 ,,	,,	,, ...	0·3 ,, 0·4 ,,
	35 ,,	,,	,, ...	0·4 ,, 0·5 ,,
	25 ,,	,,	,, ...	0·5 ,, 0·6 ,,
	20 ,,	,,	,, ...	0·6 ,, 0·7 ,,
	18 ,,	,,	,, ...	0·7 ,, 0·8 ,,
	12 ,,	,,	,, ...	0·8 ,, 0·9 ,,
	10 ,,	,,	,, ...	0·9 ,, 1·0 ,,
	12 ,,	,,	,, ...	1·0 ,, 1·5 ,,
	2 ,,	,,	,, ...	1·5 ,, 2·0 ,,

The weekly rainfall was thus less than 0·1 in. on 80 out of 325 occasions, *i.e.*, in about a quarter of the total number of occurrences. The median value is about 0·30 in., whereas the average is found to be 0·38 in., or nearly 0·1 in. greater than the median. If the limits for "moderate" suggested above were adopted, half the values would, on the average, be classified as "light," and over long periods weeks of "light" rainfall would be always in excess.

A further disadvantage in using a fixed divergence from the average as a criterion is that a given divergence has a different significance in different districts and at different seasons of the year. For instance, in the South of England a week in which the rainfall exceeded the average by 1 in. would be recognised by universal consent as a very unusual occurrence, but in the North of Scotland a week of similar excess would not be regarded in the same light, even if regard be had to the greater average fall. Similar considerations apply with almost equal force in the cases of the remaining meteorological elements.

The classification adopted in the Weekly Weather Report is based on the frequency distribution of the values for the 25 years, 1881 to 1905. The definitions are expressed as probabilities as follows :—

Warmth.—The week's warmth is called *unusual* if it is so much above the average for the time of the year that, in the long run, it is likely to occur, for that week, only once in three years, and it is marked *very unusual* if it is likely to occur, for that week, only once in twelve years ; similarly it is called *deficient* if it is so much below the average for the time of the year that it is only likely to occur, for that week, once in three years, and *very deficient* if it is likely to occur, for that week, only once in twelve years. Otherwise it is called moderate.

Rainfall.—The week's rainfall is called *heavy* if it is so much above the average for the time of year that, in the long run, it is likely to occur, for that week, only once in three years, and it is marked *very heavy* if it is likely to occur, for that week, only once in twelve years ; similarly it is called *light* if it is so much below the average for

the time of the year that it is only likely to occur, for that week, once in three years, and *very light* if it is likely to occur, for that week, only once in twelve years; otherwise it is called moderate. When the week has been without rain, the word "nought" is inserted in the column for the district.

Sunshine.—The week's sunshine is called *abundant* if it is so much above the average for the time of year that, in the long run, it is likely to occur, for that week, only once in three years, and it is marked *very abundant* if it is likely to occur, for that week, only once in twelve years; similarly it is called *scanty* if it is so much below the average for the time of year that it is likely to occur, for that week, only once in three years, and *very scanty* if it is likely to occur, for that week, only once in twelve years. Otherwise it is called moderate. When the week has been without sunshine the word "nought" is inserted in the column for the district.

A graphic method has been adopted for fixing the limits for determining which adjective shall be used to define the characteristics of a given week. Fig. 3 is a reproduction of the diagram used for the purpose for District 5, "England South." The thick lines in the centre of the shaded belts in each section of the diagram represent the average values "for the time of year" for accumulated temperature above and below 42°, sunshine and rainfall. In order to eliminate minor irregularities which will probably disappear when a longer series of records becomes available, the "crude" averages obtained from the figures have been smoothed by the formula $\frac{A + 2B + C,}{4}$ in which B stands for the crude average of the week under consideration, A and C stand for the crude averages for the preceding and succeeding weeks. These smoothed averages have been adopted as averages "for the time of the year."

When the smoothed average values had been plotted, the frequency distribution of the divergencies from the average was found for suitable intervals for each element, and with its help a curve was set off above the line of averages at such a distance from it that one-third of the total number of values in the 25 years fell above it and two-thirds fell below it. The chance that the value for a given week falls above the corresponding subsidiary line is then one in three and the limits are thus set for identifying the values to be described as "unusual," "abundant," and "heavy."

Similar curves were then set off below the lines of averages for each element at such distances from them that one-third of the values fell below them. These in turn gave the limits for identifying the values to be described as

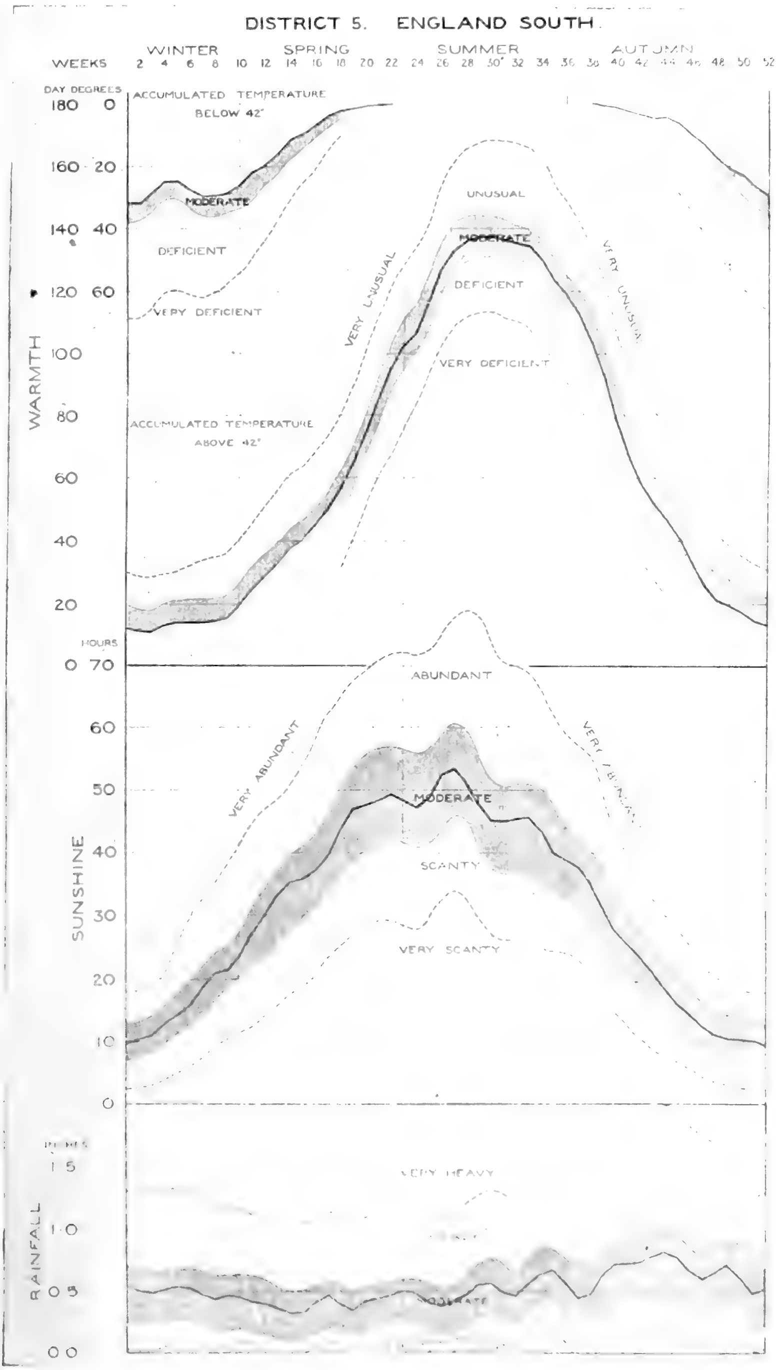


FIG. 3. Classification of weeks in District 5, "England South." The thickened curves in the centre of the shaded belts are the smoothed averages "for the time of the year." The regions of "moderate" values for each element have been shaded. In the section devoted to "warmth," the upper curves refer to accumulated temperature below 42°. For this element the number of day-degrees is measured downwards from the line of zero, which is at the top of the diagram.

"deficient," "scanty" and "light." All values falling between two corresponding subsidiary curves are classed as "moderate." In the diagram the regions of "moderate" values have been shaded. Finally two more curves were set off from the lines of averages at such distances from them that one-twelfth of the total number of values fell respectively above the upper and below the lower curves. The chance that a given value should fall outside the limits defined by one or other of these curves is accordingly one in twelve, and thus the values to which the adverb "very" is to be prefixed can be identified. In the diagram these curves are shown dotted.

In the warm season of the year the warmth of the weeks can be classified entirely on the basis of accumulated temperature above 42°, but during the cold months the accumulated temperature above 42° only serves to identify the weeks of unusual warmth. The weeks of deficient warmth have to be identified from the amount of accumulated temperature below 42°. Weeks which fail to reach the limit for "unusual" on the score of accumulated temperature above 42° and the limit for "deficient" on the score of accumulated temperature below 42° are classified as "moderate." Weeks in which the accumulated temperature "above 42°" and "below 42°" both surpass the critical values have not occurred in the past 25 years.

A short account of the details of the method of constructing the working diagrams will be of interest. As the method is precisely similar in all cases, we will confine our attention to the consideration of the rainfall in District 4, "Midland Counties," for which the classification diagram is reproduced in the upper diagram A of Fig. 4, on an enlarged scale. In order to take account of the seasonal changes in the range of the divergence from the average, the year was divided into eight periods of six or seven weeks, as follows :—

Period I	...	6 weeks	2nd	to	7th weeks	January 8 to February 18
,, II	...	7 ,,	8th	,,	14th ,,	February 19 to April 8
,, III	...	7 ,,	15th	,,	21st ,,	April 9 to May 27
,, IV	...	6 ,,	22nd	,,	27th ,,	May 28 to July 8
,, V	...	6 ,,	28th	,,	33rd ,,	July 9 to August 19
,, VI	...	7 ,,	34th	,,	40th ,,	August 20 to October 7
,, VII	...	7 ,,	41st	,,	47th ,,	October 8 to November 25
,, VIII	...	6 ,,	48th	,,	1st ,,	November 26 to January 8

As we are dealing with records extending over 25 years each period of six weeks contains 150 values ofd ivergencies from average, and each period of seven weeks contains 175 such values. For each of the periods of six weeks the frequency distribution of the 150 values was determined and from it the 50 largest positive and the 50 largest negative divergencies were selected. Thus the values of the divergence from average which would differentiate the "moderate" from the "heavy" and "light" rainfalls were fixed. The twelve largest positive and twelve largest negative divergencies were then similarly selected to determine the limits for distinguishing the "very heavy" and "very light" values. The periods of seven weeks were treated in an analogous manner.

The results are shown in the following table:—

	I.	II.	III.	IV.	V.	VI.	VII.	VIII.
Weeks.	2 to 7	8 to 14	15 to 21	22 to 27	28 to 33	34 to 40	41 to 47	48 to 1
Divergence for—								
Very heavy ...	+ ·80	+ ·58	+ ·60	+ ·70	+ ·79	+ ·80	+ ·85	+ ·75
Heavy ...	+ ·07	+ ·10	+ ·09	+ ·20	+ ·13	+ ·15	+ ·22	+ ·20
Light ...	− ·23	− ·22	− ·23	− ·24	− ·22	− ·27	− ·26	− ·27
Very light ...	− ·41	− ·35	− ·40	− ·40	− ·38	− ·48	− ·51	− ·45

Sudden breaks would occur in the curves which define the limits if these divergencies were applied to the curve of averages as they stand. In order to avoid such sudden discontinuities the values given in the above table were plotted on a diagram in the manner shown in the lower diagram, B of Fig. 4, the divergencies from average being set off as ordinates at points corresponding with the central epoch of each period. The points thus found were joined by a smooth curve, and the divergencies for the various limits appropriate to each week were then set off from the curve of smoothed averages. In the cases of warmth and sunshine the figures vary over a very wide range and the necessity for interpolating between the various periods is much greater than in the case of rainfall. For instance, in District 5, "England, South," (see Fig. 3), the limit for "very abundant" sunshine exceeds the average by 28 hours in the 28th week, whereas in the first week it is only eight hours above it.

We cannot here enter into the various meteorological questions which arise out of the diagrams, but attention may be drawn to a few points of interest in the diagrams reproduced in

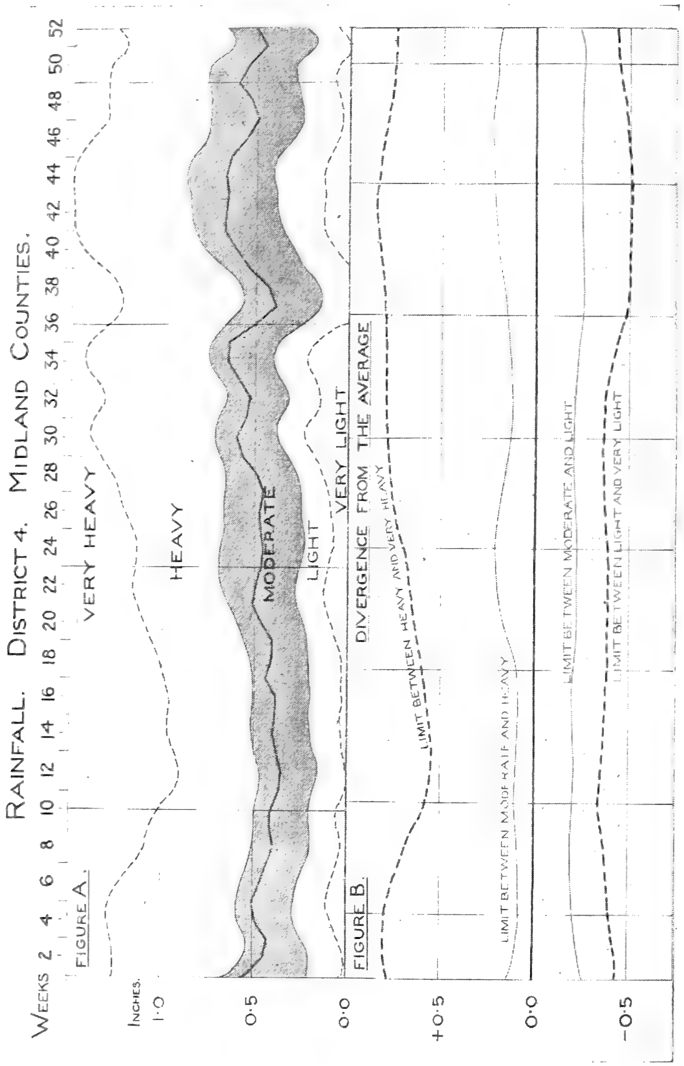


FIG. 4.

Figs. 3 and 4. In both the rainfall shows a decided decrease in the average about the 38th week (middle of September), indicating the frequent recurrence of exceptionally dry weather about this time of the year. The limiting line for "very

light" falls below zero, showing that the chance of the week being without rain is greater than one in twelve. This feature is found to occur in the statistics for all districts; it is particularly marked in the North of Scotland.

Another interesting point is the large divergence from the average of the limit for "very heavy" rainfall about the middle of autumn in District 5, showing that weeks of heavy rainfall are comparatively frequent in that season in the South of England. This feature is shared by District 8, "England, South-west," but it is much less marked farther to the North.

In the sunshine curve for District 5, the most noteworthy feature is the relative scantiness of sunshine about the 24th and 30th weeks—second week in June and last week in July. The deficiency in the 24th week finds its counterpart in a slight inflection of the curve for accumulated temperature above 42°.

All the temperature readings used in computing the tables of accumulated temperature in the Weekly Weather Report are from thermometers exposed in screens of standard pattern at a height of about four feet above the ground. It not infrequently happens on calm, clear nights that the temperature on the ground falls several degrees below that in the screen, and sharp ground frosts which do considerable damage to low growing vegetation may occur without the screen temperature falling far below the freezing point. The incidence of ground frosts is often very local and depends very largely on the topography of the land, and thus it is not practicable to combine the readings from thermometers exposed on the grass at a number of stations into mean values for districts. Information as to the incidence of ground frosts is given for a number of stations in a separate table in the Weekly Weather Report. The data are summarised by stating the lowest temperature on the grass experienced during the week and the number of occasions on which the thermometer fell below the freezing point by at least 2°. For several of these stations the mean temperatures of the soil at depths of one foot and four feet are also given.

R. G. K. LEMPFERT.

NOTE.—It is proposed in future numbers of the JOURNAL to give a summary of the weekly weather reports of the Meteorological Office, special attention being directed to all variations from the normal described above as "moderate." In order to illustrate and give point to these records the Board will endeavour to collect and publish a series of observations of the effect of such abnormalities on the progress of the crops of the farm and garden, and their influence on live-stock and the wild life of the country. They will be glad to receive the names of persons who are prepared to make short but systematic and carefully prepared records and send them to the office of the Board, 4, Whitehall Place, London, S.W., at the conclusion of each month. A list of the subjects on which reports are wanted may be obtained on application (see p. 54).

MAIZE AS A FODDER AND SILAGE CROP.

When William Cobbett returned from America early last century he brought with him some maize seed, hoping to introduce to British agriculture a new and highly promising cereal crop. With characteristic energy he sounded its praises, and in fact called it one of the "three great undertakings, or rather, great additions to the wealth of the nation, introduced under the name of *Cobbett*." But "Cobbett's Indian corn," as it was called, soon failed, for it would not ripen here, and for a long while it was almost totally neglected.

During the last twenty years, however, the value of green maize as a fodder crop has been repeatedly urged; it has at various times and in many parts of England been shown that considerable crops can be obtained, furnishing valuable food during September and early October. Mr. T. J. Young, at Holmes Chapel, has produced up to 36 tons per acre; reports from Norfolk show that 30 tons can be obtained there; similar crops are recorded in Essex, in East Kent, and elsewhere. It is even customary in some places to adopt the American plan and convert maize into silage for use in spring when roots are beginning to give out, and before the weather is sufficiently warm for the cattle to be put out to grass.

In order to discover whether maize could profitably enter into

the ordinary scheme of farming, experiments were begun in 1901 by Mr. F. B. Smith at the South Eastern Agricultural College, and are still in progress. Several acres of maize are grown each year; part is fed green to stock, and the rest is put into a silo; analyses of the maize and silage are also made in the chemical laboratory.

The method of cultivation has been fully described by Mr. Smith in the Journal of the South Eastern Agricultural College for 1902, and by Mr. Young in the same Journal for 1903; it is also dealt with in Leaflet No. 73 of the Board of Agriculture. Light soils and loams seem well suited to the crop, and the preparation is much the same as for roots; dung is ploughed in in autumn or winter and the land worked in spring to produce the necessary good tilth. As the seed requires a high temperature for germination it is useless to sow too early; the beginning of June is usually soon enough, and it is thus sometimes possible to put in maize after another crop has failed. The seeding need not be too heavy, and the rows should not be too close, or the plants do not have an opportunity for full development; from 18 in. to 2 ft. seems to be a suitable distance between the rows. Two or three bushels of seed are generally used; it is buried about three inches, a harrow and heavy roller are sent over at once, and then, without delay, the ground is strung to keep off rooks.

When the plant is up, it is usually necessary to side hoe and horse hoe. A light dressing of nitrate of soda is beneficial at this stage, and it may be repeated should a spell of cold weather set in to keep the crop back. A fairly high temperature is wanted for growth, but, when once established, the crop obtains the necessary water without difficulty, and can readily withstand drought. In very dry seasons, *e.g.*, in 1901, it has proved extremely valuable in supplying excellent green meat at a time when other keep had run out. In cold wet seasons, however, it is not so useful; the crop is small and of inferior quality.

There seems to be no doubt that the cost of production is less than that of roots, and sometimes considerably less. At Wye the cost is about £4 per acre exclusive of rent and rates, and 18 tons would be considered a good average crop. On better soils 20 to 30 tons would be more common. The crop is remarkably free from disease.

Maize as a Fodder Crop.—When wanted for green meat the crop may be cut at any time, but in a favourable season it grows so rapidly during July and August that to cut during those months would entail considerable loss. It may, however, be taken during September, and fed to stock in pieces about 1 in. in length. Another plan, occasionally adopted on light soils in East Kent, is to run sheep on to the growing crop, and when they have cleared all they will, to cut and plough in the remaining stalks.

The composition of the crop depends very much on the season. In warm dry summers the large crops produced are of excellent food value, and contain a considerable amount of dry matter, as will be seen from Table I.

There is some similarity between these results and the figures obtained for grass, indeed in many respects maize can be more nearly compared with grass than with any other British crop. It is characteristically deficient in protein and in mineral matter, for which reason a large crop does not exhaust the land as much as might be supposed. The great value of the crop is evident when it is remembered that 20 tons of food stuff per acre was obtained less than four months after sowing the seed, during seasons when our grass ran short. It is not too much to say that there is no other crop commonly cultivated which gives so much food stuff in so short a time.

TABLE I.—Average Percentage Composition of Green Maize, end of September and early October. Good seasons.

Year.	Dry Matter.	Ether* Extract.	"Protein" (Nitrogen × 6·25).	Nitrogen† Free Extract.	Fibre.	Ash.	Sugar.
	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.
1901... ...	21·9	0·85	1·9	13·6	4·25	1·3	—
1905	18·7	0·52	2·04	9·88	5·30	0·98	1·0
Pasture grass	23·3	0·9	4·0†	10·9	5·2	2·3	—

* The "ether extract" is often called oil and the "nitrogen free extract" called "soluble carbohydrate."

† 1·1 of this is non-protein. *Vide* "Warington, Chemistry of the Farm," p. 130.

In a cold wet season the crop is less, and there is also a lower percentage of dry matter.

TABLE II.—Average Percentage Composition of Green Maize, end of September and early October. Bad Season.

Year.	Dry Matter.	Ether Extract.	"Protein" (Nitrogen × 6·25).	Nitrogen Free Extract.	Fibre.	Ash.	Sugar.
	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.
1903... ...	13·35	0·16	1·81	6·70	3·83	0·79	1·5

The dry matter, which is 20 per cent. in a good season, drops to only a little over 13 per cent. in a bad one, and this change in composition indicates a marked fall in the feeding value. It will be observed that the difference in composition shows itself mainly in the nitrogen free extract, a somewhat indefinite but very nutritious group; the "protein" and fibre do not vary much in the different years. The amounts of dry matter and of nitrogen free extract fall within the limits of Tables I and II in seasons which are better than 1903 but not as good as 1901 or 1905.

TABLE III.—Average Percentage Composition of Green Maize, end of September and early October. Intermediate Seasons.

Year.	Dry Matter.	Ether Extract.	"Protein" (Nitrogen × 6·25).	Nitrogen Free Extract.	Fibre.	Ash.	Sugar.
	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.
1904... ...	15·00	0·66	1·59	8·06	3·74	0·95	0·80
1906... ...	15·09	0·22	1·58	8·39	3·93	0·97	

The crop is never quite even; it is possible on the same day to pick out large, well advanced plants, and small, less mature ones, and analysis shows that the latter are less nutritious than the former. Thus, in 1904, when the average percentage of dry matter over the whole field was 15, the large well developed plants contained 19 per cent. and the small stunted ones only 12·7 per cent.; the constituents of the dry matter seemed to be much the same in both cases.

Since the crop never ripens here, it suffers no deterioration as does ordinary grass, and so long as the weather is warm enough for growth to continue the crop seems to improve. It is, however,

very sensitive to cold weather, and frosts are fatal to it; after a time, also, the birds begin to discover the half-formed ears. We have already seen that the crop cannot profitably be used before the end of August; it cannot be relied upon after the first week in October, so that the period over which it is available is limited. But during the six weeks that it can be had it is without doubt an excellent crop, not quite like anything else commonly grown, somewhat resembling grass, except that it contains less protein and mineral matter. It can be given to all kinds of stock; dairy cows, bullocks, sheep, horses, and even pigs, all take it eagerly and do well on it, and it is well worth a trial on farms where there is a shortage of keep during September.

Maize as a Crop for Silage.—The practice of converting maize into silage seems to have been originated by Reihlen of Stuttgart, about 1862, but it was not well known till 1875, when Goffart published his "*Memoire sur la culture et l'Ensilage du Mais-fourrage.*" It was subsequently taken up on the Continent, in England, and to an enormous extent in America. Ensilage attracted a good deal of attention here during the wet cycle of years culminating in 1883; an elaborate report on the subject was presented to the Royal Agricultural Society by their Secretary, Mr. H. M. Jenkins, and published in their *Journal* in 1884, and in 1885 a Commission sat under Lord Walsingham to collect evidence and report thereon. Some of the witnesses were very enthusiastic about silage and stated that by its means their land had been enabled to carry a larger head of stock with more profit than before, that winter butter, previously impossible, could now be made, and that generally the productive capacity of their farms had been considerably increased. Notwithstanding much evidence of this sort, however, the process has by no means become general.

The silo used at Wye is a wooden cylindrical structure 12 ft. in diameter and 17 ft. high, standing in an extension of the barn. The maize is cut into pieces about an inch long, then thrown in, spread evenly and trampled; rapid shrinkage takes place and three or four fillings are required. When there is no more maize to go in the mass must be covered up to exclude air as far as possible; this can be done by putting on a thick layer of chopped green material of less value than maize, or by throwing on some seed to germinate and form a fibrous mass of roots. No pressure is applied, the mass sinks by its own weight. For the first

few days the temperature rises to something between 80° and 125° F.; it then slowly falls, but for months the silage is warm.

The changes taking place have been investigated by the writer in conjunction with Mr. H. E. Annett; they are very complex, but it appears that the essential changes are partly brought about by the plant cell as a consequence of the diminished air supply, and partly by the substances formed in the cell, known as enzymes, which act both before and after death. The mass becomes more acid and a large number of substances are formed. Some of these prevent the development of mould, the absence of which is characteristic of good silage, but they do not altogether inhibit the action of bacteria, for certain kinds are always present and can be detected even after six months. These bacteria cause further changes, which, though of a secondary nature and not at all an essential part of the process, at any rate do not appear to involve the formation of any very injurious substance.

There seems no reason why silage should not be fed almost at once, but it is probably more economical and certainly more usual to keep it till February when roots are running short. The top few inches are usually rotten and should be thrown away, the rest is taken as required in horizontal layers, avoiding, as far as possible, the entrance of air into the mass. Silage has a greenish brown colour and a smell which has been likened by various writers to strong tobacco and to pickled cabbage, but is really a blend of several odours derived from its numerous constituents. The composition is very constant and shows far less fluctuation than that of the original maize.

TABLE 4.—Average Percentage Composition of Maize Silage.

Year. (Date of filling Silo.)	Dry Matter.	Ether Extract.	"Protein" (Nitrogen × 6·25).	Nitrogen Free Extract.	Fibre.	Ash.	Sugar.
	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.
1902... ...	12·10	0·16	1·33	5·08	4·66	0·98	Nil.
1903... ...	12·20	0·10	1·35	5·67	4·13	0·95	,,
1904... ...	13·79	0·83	1·65	5·15	5·06	1·10	,,
1905... ...	13·56	0·56	1·63	5·38	5·06	0·93	,,
1906... ...	13·32	0·29	1·30	5·61	5·20	0·92	,,
Average ...	12·99	0·39	1·45	5·38	4·82	0·98	,,
Mangolds ...	12·5	0·1	1·1	9·6	0·8	0·9	7·5

We compared green maize with grass, but as silage is fed in February and March it is only fair to compare it with mangolds; unfortunately, such a comparison is possible only in a very general way. Silage contains more ether extract, but much of this consists of acid and only little fat is present. The amount of nitrogen is about the same in both, in both, too, it is largely present in non-protein combinations, known as amino-acids, amides, &c. There is a considerable difference in the amount of nitrogen free extract, of which mangolds contain 9·6 per cent., chiefly in the form of sugar, while silage contains only 5·3 per cent., mainly as easily attacked celluloses with a certain amount of acid. On the other hand, silage contains a large amount of fibre, and mangolds only a little. The total dry matter is much the same in both.

The great difference in the amount and the nature of the nitrogen free extract strongly suggests that silage has less feeding value than mangolds. This conclusion is also supported by general experience with stock on the College farm. It has always been noticed that stock preferred mangolds to silage, and they seemed to do better on it. American experience is exactly the reverse, but their silage is much richer in nitrogen free extract and in dry matter than ours.

	English Silage.	American Silage.*
	Per cent.	Per cent.
Dry matter	13·0	21·8
Nitrogen free extract	5·38	11·0

* Mean of 99 analyses; quoted by Henry in "*Feeds and Feeding.*"

A comparison made on similar lines between silage and roots shows that silage is probably inferior to them also; but notwithstanding its inferiority to roots or mangolds, it is well known to be quite a useful food, readily taken by bullocks and also, with certain exceptions, by dairy stock, when they have become accustomed to it. With proper care, too, the milk is not tainted.

During the process of ensilage there is considerable loss of weight. It is sometimes supposed that this is chiefly due to the evaporation of water, but the above analyses show that this cannot be the case since silage generally contains more water than the original maize. There is an actual loss of nutritive material, and the value of ensilage to the practical man depends entirely on the extent of these losses.

During the past three seasons experiments have been carried out to ascertain what the losses actually are. A large sample of maize, weighing about 20 or 30 lb., is taken at the time of filling the silo, a small sub-sample is drawn from this for analysis, and the bulk weighed into a sack and sewn up. A maximum thermometer is also put in to register the temperature. Several similar sacks are prepared and thrown into the silo at different depths. When, some months later, the sacks are recovered, the contents are weighed and analysed and the loss calculated.

The figures for one of the bags in the season 1905–06, which may be taken as typical, are given in the table below, and it is important to notice that the losses shown take place in the sound part of the silage; they become even greater if allowance is made for the decomposed and useless matter at the top of the silo. The loss in dry matter has not been less than 29 per cent., it has even risen to 47·6 per cent.; the nitrogen free extract suffers most and the fibre least. The figures lend no support to the common view that indigestible fibre breaks down and becomes nutritious during the process.

——	Fresh Materials.	Dry Matter.	Nitrogen Free Extract.	Fibre.	Protein.
	lb.	lb.	lb.	lb.	lb.
Put into bag	18·5	3·48	1·77	1·03	·35
Recovered from bag...	15·5	2·10	·83	·78	·25
Loss in lb.	3·0	1·38	·94	·25	·10
Percentage loss ...	**16·21**	**39·62**	**52·97**	**24·17**	**28·30**

Can these losses be avoided? There is no reason to suppose that they can to any great extent. Their cause is fairly well established: they are partly due to physiological processes going on in the cell before and probably after death, and partly to the activity of micro-organisms. When the maize is put into the silo the cells are still living, respiration continues, though in an abnormal form, and the sugars and other substances in the cell are resolved into carbonic acid, water, volatile acids, &c. This process involves an absolute loss of material, since the cell is no longer able to elaborate new food, and one does not at all see how it can be prevented by any economical means. The loss due to bacterial activity can be minimised, but not altogether prevented, by careful exclusion of air. The conditions obtaining in the silo are not favourable to the develop-

ment of most micro-organisms, though some bacteria flourish and produce further changes.

American losses appear to average about 20 per cent. of the dry matter, but their maize is more mature than ours when put into the silo, and all experience goes to show that mature maize suffers less loss in the silo than immature. The difference in composition is set out below :—

—	Dry Matter.	Nitrogen Free Extract.	Fibre.
	Per cent.	Per cent.	Per cent.
American maize	20·7	12·2	5
English maize*	16·8	8·74	4·52

* Average of years when loss was determined.

There seem to be only two ways of reducing the loss—

(1) To exclude air rigidly, which would be more effectively done in a cement silo than in one like ours, made of vertical wooden staves ;

(2) To select varieties of maize which can be relied upon to give large and more mature crops containing 20 per cent. of dry matter without an undue amount of fibre.

But even suppose this to be done, it seems doubtful whether maize silage can ever seriously compete in this country with roots or mangolds, except in places where these crops are unusually costly. It appears to have less feeding value, and the loss on production is very high.

Summary.—Large crops of maize can be produced in a number of districts, including parts of Cheshire and of Norfolk.

The composition somewhat resembles that of grass; it depends on the season, and is least satisfactory in cold, wet seasons when the crop is small, and most satisfactory in hot, dry ones when the crop is large.

All classes of stock take to maize, and it is well worth a trial where succulent fodder is wanted during September.

Maize can be converted into silage, which is quite a useful food, though inferior to roots and mangolds. In the process of manufacture the loss of dry matter was found to vary between 30 and 40 per cent., which loss falls mainly on the nitrogen free extract and least on the fibre. Except when mangolds are unusually costly, it hardly appears worth while growing maize for the production of silage.

EDWARD J. RUSSELL.

THE PREVENTION OF DAMAGE TO FRUIT BY FROST.

The desirability of finding some adequate means of preventing the enormous damage caused to British fruit growers by spring frosts has been brought home very seriously during the past three or four years, when in most districts hundreds of tons and many thousands of pounds' worth of fruit have been entirely destroyed, in some cases by only a few hours of frost on a single night during the blossoming time in early spring.

It would appear that up to the present few efforts of a serious nature or on a commercial basis have been made in this country, though in France, America, Scandinavia, Algeria, and other countries, systematic efforts have been made for years past.*

The practice of burning garden rubbish, dried weeds, hay, straw, &c., in some cases supplemented by additions of tar, water, and such-like, to produce dense smoke, has been tried with fair results, but, for a large acreage, it is in practice almost impossible to command sufficient combustible material for a frost of some hours' duration on several consecutive occasions, to say nothing of the large staff of men required to damp down and attend to the large number of fires necessary. Experience proves that a flame is apt to break out at any moment, and damage to trees and bushes, and waste of burning material may result. In addition to this, little heat is given out, and heat as well as smoke appears to be necessary to produce any effective results.

I will proceed to explain, to the best of my ability, the system adopted for protection last spring on the Toddington Orchard Company's plantations near Winchcombe, Gloucestershire, by Mr. Charles Martin, and by myself on my own fruit farm at Pershore, in Worcestershire. On both areas the work was carried out on low-lying land particularly subject to the effects of frost.

The preliminary investigations were conducted almost wholly by Mr. Martin, who obtained, partly through the Board of Agriculture, and partly from British Consuls in a number of foreign countries, valuable information as to existing methods. Patent preparations known as *foyers* were imported from Bordeaux. These are used in the grape-growing districts of

* See *Journal*, April, 1906, p. 57; June, 1906, p. 184; and September, 1906, p. 375.

France, and consist of wooden boxes about 10 in. square and 8 in. deep, containing a resinous compound which produces considerable smoke when burning. These, however, are far too dear for commercial use, costing nearly 1 franc each in Bordeaux. Experiments were also made with crude naphthalene salts mixed with dry soil, saw-dust, and other materials ; considerable smoke resulted, but little heat, and great difficulty was experienced in keeping the fires alight.

A cast-iron bucket, as used in California (where the system is known as smudging) was afterwards designed for burning petro-

leum, but it was found that the receptacle must necessarily be smaller at the top than at the bottom to prevent too rapid combustion, and this made it appear impossible to use cast-iron, which we believe would otherwise be preferable to tin.

Ultimately a tin can, such as appears in the illustration, was designed, the height being 9 in., diameter at base $8\frac{1}{2}$ in., diameter at top $6\frac{1}{2}$ in. Two rows of round holes, each about $\frac{3}{4}$-in. diameter were pierced round the upper part of the can to admit draught. It was necessary to have all the joints grooved, as no soldering would withstand the heat produced. The cost of each can was 9*d.*

Observation undoubtedly proves that frost does infinitely more damage when the trees and atmosphere are damp than when the air and soil are dry ; in fact, the blossom has often been known to be unharmed after a severe dry frost. It would also appear that damage rarely accrues to the blossoms of hardy fruits, unless the severity of the frost is 4 degrees or more.

The material burned, both at Pershore and at Toddington with success, was creosote, with the addition of some naphthalene salts and a little water ; the cost was about 4*d.* per gallon. Each tin pot held one gallon of the fluid, which burned for from three to three and a half hours, according to the amount of wind. In California crude or unrefined petroleum is burned with success, nearness to the oil wells making this a very cheap form of fire. Up to the present it has been impossible to obtain any of this material in England, as apparently the oil is never imported here in its unrefined state.

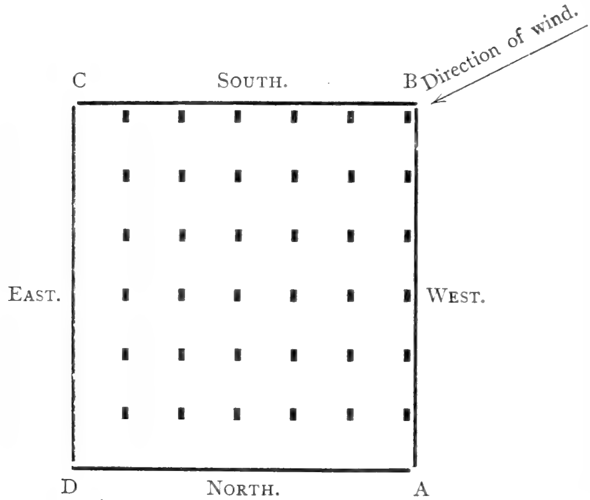
With an ordinary spring frost it would rarely be necessary to light the fires before, say, an hour before dawn, at which period of the night the frost is usually most severe ; thus, if the fires are lit at 2.30 or 3 in the morning, to burn till, say, 5.30, the critical time would be covered. In a specially severe case, as on April 26th last year, when such enormous damage was done, it was necessary to ignite the pots at 10 p.m., the frost being then some 4 to 6 degrees, with a steady increase to 12 degrees at Pershore and 18 degrees at Toddington at 4.30 the following morning. In this instance it was found necessary to refill the tins between 1 and 2 o'clock in the morning, and they then just lasted over the dawn. By means of a can with a long spout, the pots may be filled up without danger while still alight. One filling, however, at the time above stated, should be sufficient in a frost of ordinary length and severity. In order to insure success, about forty pots should be used to the acre.

Taking the acre as a square, the pots should be distributed approximately as shown on the plan. In this case the wind is from the south-west. Should the wind be from the north-east, the pots along lines AB and BC would be moved to lines AD and DC.

White stakes or signals of some kind should be placed at the ends of all rows as an indication of the whereabouts of the pots, which are sometimes difficult to find in the darkness. The pots

should, of course, be kept ready filled in their places during the whole time the blossom is out, and there is any risk of damage by frost. They should be covered with some sort of rough lid to prevent the rain getting into them, which would make the ignition of the fluid rather difficult.

A useful instrument was designed for us by Messrs. Crabtree, of Birkenhead, in the shape of a thermometer so constructed as to ring an electric bell when the mercury touches freezing point, the connection passing through the mercury. The bell is placed in the bedroom of the unfortunate frost fighter, the thermometer in the garden outside. On the bell ringing a call



Pots in position for a south-westerly wind on an acre of plantation.

to arms, bed should at once be quitted, clothes hastily donned, and the fight commenced. The fires are easily ignited with a torch. It is necessary to put a small wisp of hay into the fluid to start ignition.

In my own case the plantation operated on was one of half-standard Victoria plums, with red currants between, also mixed plum and apple half-standards with gooseberries beneath.

My own idea is that the process answers best where the trees are thick and the smoke hangs. The heat produced by the fires had a very noticeable effect on thermometers placed in the trees, the temperature rising several degrees. An enormous pall of black smoke hung like a heavy blanket some 8 or 12 ft. from the ground, enveloping the trees satisfactorily.

The Victoria blossoms were just at the most susceptible stage for damage by frost, the petals having just dropped, there being yet no foliage, and the embryo plum being fully exposed.

The result was very gratifying. Near the pots in some cases there were as much as 50 or 60 lb. of plums on each tree, and a full crop of gooseberries. In my eagerness to save my fruit, I spread my 150 available pots over rather too large an area, and used only some twenty-five instead of forty pots to the acre. Had the latter number been used, I have no doubt I should have saved an even larger quantity of fruit.

Financially the effort was satisfactory. As far as can be judged, taking forty pots as necessary to each acre, with a gallon of material to each pot, the cost should not exceed 20*s.* per acre per night, allowing 5*s.* per acre for labour. This would not include the value of the pot, which, however, with care should last for years.

It is, of course, extremely difficult to gauge the exact amount of fruit which can be directly attributed to the fire, but in the case of the operations at Toddington, Mr. Martin values the cherries, plums, gooseberries, currants, &c., saved at at least £150, while on my own farm, where the acreage treated was far smaller, I estimate the plums, apples, gooseberries and currants saved at £75. The expense on the latter, even including the pots (which are available for use again), material, labour, &c., did not amount in all to over £12, and I had the fires going on several frosty nights. On exactly similarly situated plantations, and where no fires were placed, there was practically a complete absence of tree or bush fruit. The process appears impracticable for strawberries or crops actually on the ground, as the smoke cannot be kept sufficiently near the ground to do any good.

The greatest objection to the preparation burned was the intensely black and oily smoke which permeated everywhere; it may, however, reasonably be supposed to have the advantage of killing a certain number of aphides and other fruit pests which hatch out about the period the fires are used.

No damage from the heavy smuts or smoke was noticeable to any vegetation, and probably the carbon on the ground would be useful.

All data, results, &c., of the experiments are now in the hands

of the Principal of the South Eastern Agricultural College at Wye, where further investigations and experiments are being made on a scientific basis, such as is impracticable to the ordinary fruit farmer. Any information or experiences will be welcomed by that Institution. GEOFFREY F. HOOPER.

Experiments in Turnip Manuring.

The Aberdeen and North of Scotland College of Agriculture have carried out experiments in turnip manuring* on a number of farms in 1903, 1904 and 1905. Taking the average of the three seasons, satisfactory results were obtained from an application of $\frac{7}{8}$ cwts. sulphate of ammonia, 6 cwts. superphosphate, and $\frac{3}{4}$ cwts. sulphate of potash, the yield being 18 tons 2 cwts.; the omission of the potash reduced the yield to 15 tons 1 cwt. of the phosphate to 9 tons 18 cwts., and of the nitrogen to 16 tons 5 cwts., showing, as is well known, that phosphates are, in the majority of cases, the most essential constituent of an artificial manure for turnips. Potash, however, is often deficient, and it is worth while for each farmer to experiment for himself in order to discover the wants of his soil. The trials also showed that bone meal and ground mineral phosphate were much inferior to superphosphate and slag as turnip growers. Superphosphate is a little more effective than slag, but a mixture of both is generally good.

Several plots received 10 tons of dung together with artificial manures. Ten tons of dung alone produced a crop of 16 tons 3 cwts., the addition of about one-half of the complete artificial manure mentioned above increased this yield to 21 tons 6 cwts., so that a small complete dressing of 3 to 4 cwts. per acre may be taken as giving a profitable return when used with 10 tons of dung. No advantage was obtained from doubling the quantity of superphosphate, while a reduction ensued from the omission of the ammonia and potash.

Trials with large and small dressings of dung showed that very little is to be gained on the turnip crop by increasing the dressing beyond 10 tons per acre.

* Bulletin No. 3. Copies of this and similar publications are filed in the Board's Library, and can be borrowed on the usual conditions.

Feeding Value of Mangolds.

The question of improving the feeding value of roots and of ascertaining the factors on which the feeding value depends, is the subject of experiment at several of the Agricultural Colleges.* At Cambridge, attention has been chiefly directed to mangolds, and the possibility of breeding improved strains has been under trial for several years. There is very great variation in the percentage of dry matter in different roots, and there seems no reason why the careful selection of roots as seed-mothers should not ultimately result in raising the percentage of dry matter without decreasing the cropping power. But it is a question whether the feeding quality of the mangolds is in direct proportion to the percentage of dry matter which the roots contain; for example, if yellow globe mangolds contain 10 per cent., and long reds 12 per cent. of dry matter, is a 30-ton crop of the latter worth as much to the feeder as a 36-ton crop of the former? To obtain some information on this question the Agricultural Department of Cambridge University has carried out seven experiments during the past three years under conditions which may be taken as representing the common practice of the stock-feeder in the Eastern counties.

The experiments are described in detail in the "Guide" for 1906 issued by the department. They indicated that the feeding value of mangolds is not always directly dependent on the percentage of dry matter present; at the same time there was no evidence that one variety of mangold is more wholesome than another, and the stock fed on the different varieties were equally healthy. If further work should prove, as it very likely may, that the dry matter of certain kinds has a relatively high value, the explanation will probably be found in the quantity and character of the proteids contained in the dry matter. This, it is stated, opens up a question which is not yet ripe for discussion; doubts have been raised as to the value of the usual analytical methods employed in estimating proteids, and practically nothing is known of the food value of the different proteids in mangolds.

---

* See *Journal*, vol. xii, p. 353, September, 1905; vol. xiii, p. 282, August, 1906; and vol. xiii, p. 416, October, 1906.

English potato growers have found that good crops cannot be relied upon without frequent changes of seed, and at the present time large quantities of seed potatoes are regularly procured from Scotland. The somewhat similar climate of parts of Scotland and Ireland suggested to the Irish Department of Agriculture that Irish seed would give a very good account of itself in England if tested against Scottish seed, and that there was no good reason why England should not look to Ireland as well as to Scotland for a suitable change of seed. Arrangements were accordingly made to carry out a series of tests at a number of centres, with the result shown in the following table :—

Trials of Irish Seed Potatoes.

AVERAGE Yield per Acre from Irish and Scottish Seed Potatoes grown at a number of Centres in England, Scotland and Wales.

	Ninetyfold.						British Queen.						Up-to-Date.					
	Irish.			Scottish.			Irish.			Scottish.			Irish.			Scottish.		
	T	C.	Q.	T.	C.	Q.	T.	C.	Q.	T.	C.	Q.	T.	C.	Q.	T.	C.	Q.
England ...	7	6	3	6	13	1	10	14	3	10	5	0	11	15	0	10	18	3
Scotland ...	8	4	3	8	1	1	11	14	1	11	11	1	12	16	3	13	1	2
Wales ...	9	3	1	9	15	0	11	2	3	10	13	2	13	11	1	13	4	1

The Ninetyfold variety were tested in England at five centres the British Queen at eight centres and the Up-to-Date at nine centres. In Scotland all varieties were tested at three centres, and in Wales all were tested at two centres.

The average yields show that with each of the three varieties Irish seed has given heavier crops in England than Scottish seed. In Scotland with the varieties Ninetyfold and British Queen, the average yield from Irish seed was slightly heavier than the yield from Scottish seed, while with Up-to-Date the home grown seed gave on the average rather heavier crops. In Wales, the Irish seed was the more satisfactory with the varieties British Queen and Up-to-Date, while Scottish seed gave a higher average yield with the Ninetyfold variety.

Irish seed was also compared with English seed, with striking results, as with the exception of British Queen in Scotland, Irish seed eclipsed English in a marked manner. The department, therefore, urges Irish farmers to endeavour to obtain a share in the trade in seed potatoes.

Canada.—A Canadian Order in Council, dated January 14th, 1907, provides new regulations for the importation of live stock into the Dominion, the regulations of March 30th, 1904 (published in this *Journal* in March, 1905), being rescinded.

Live Stock Import Regulations.*

Permits.—Persons contemplating the importation of animals other than horses from any part of the world, except the United States and Newfoundland, must first obtain from the Minister of Agriculture a permit, stating the number and kind of animals to be imported, the country of origin, and probable date of shipment, the port of embarkation, the port at which the animals are to be landed, and the approximate date of their arrival, and such permit shall not be available at any port other than the one mentioned therein. Application for such permits shall be in writing and the statements in such applications may be required to be verified on oath. Animals from countries other than the United States and Newfoundland arriving at any port in Canada without such permit shall not be admitted unless and until ordered by the Minister.

Ports of Entry.—The importation into Canada of animals from all countries, other than the United States, Newfoundland, and Mexico is prohibited, except at the ports of Victoria, Vancouver, Quebec, Halifax, St. John, N.B., Charlottetown, P.E.I., and such other ports as may hereafter be indicated by the Minister of Agriculture.

All animals arriving in Canada through these ports shall be subject to inspection. All importers must certify under oath, before making Customs entry, the place of origin of the animals imported by them. Importers of animals will be required to certify under oath that the certificates hereinafter referred to apply to the animals which they purport to describe and to no other, and that the district named is the actual one from which the said animals came.

* Live stock import regulations have been published in this *Journal* for the following countries:—United States, June, 1903, and Sept., 1906; Argentina, Jan., 1905, April, 1905, Oct., 1905, and June, 1906; New South Wales, April, 1905; Germany, May, 1905; New Zealand, June, 1905; South Australia, July, 1905; France, Aug., 1905; Belgium, Sept., 1905; Uruguay, Oct., 1905; Victoria, Nov., 1905; Spain, Dec., 1905; Queensland, Jan., 1906; Western Australia, Feb., 1906; Tasmania, March, 1906; Transvaal, June, 1906; Ceylon, Cape Colony, Sept., 1906; Holland, Malta, Oct., 1906; Natal, Austria-Hungary, Nov., 1906; Russia, Hungary, Dec., 1906; Iceland, Italy, India, Feb., 1907; Isle of Man (sheep), Ireland, March, 1907.

Diseased Animals.—Any animal affected with any contagious or infectious disease, imported or introduced into Canada, shall be forfeited and may be forthwith destroyed or disposed of as the Minister may direct.

Horses, Mules, and Asses.—Horses, mules, and asses imported from countries other than the United States, Newfoundland, and Mexico, must be accompanied by the certificate of a qualified veterinarian and of the local authority of the district whence they came, stating that no glanders, "maladie du coït," or other serious infectious or contagious disease affecting horses has existed in the said district for a period of six months prior to their shipment. Such animals, if consigned to Montreal, may be, if the Minister so directs, inspected at the port of Quebec during summer navigation ; in absence of special direction of the Minister they must be inspected at the port of Montreal. Such animals landing at any of the other ports named shall be inspected at such ports.

Cattle.—Cattle imported from countries other than the United States, Newfoundland, and Mexico must be accompanied by the certificate of a qualified veterinarian and of the local authority of the district whence they came, stating that no contagious pleuro-pneumonia, rinderpest, or foot-and-mouth disease has existed in the said district for a period of six months prior to their shipment. A quarantine of sixty days shall be enforced upon cattle imported from the United Kingdom, the period of quarantine counting from the date of clearance of the vessel carrying them.

Sheep and Goats.—Sheep and goats imported from countries other than the United States, Newfoundland, and Mexico must be accompanied by the certificate of a qualified veterinarian and of the local authority of the district whence they came, stating that no foot-and-mouth disease has existed in the said district for a period of six months prior to their shipment. A quarantine of thirty days shall be enforced upon sheep and goats from countries other than those mentioned.

Swine.—Swine imported from countries other than the United States, Newfoundland, and Mexico must be accompanied by a similar certificate to the foregoing, that no hog-cholera, swine plague, or foot-and-mouth disease has existed in the district whence they came for a period of six months prior to their

shipment. The period of quarantine enforced upon swine from such countries is thirty days.

Regulations of Quarantine.—Cattle six months old and over, imported from countries other than the United States and Mexico, shall not be discharged from quarantine until they have been submitted to the tuberculin test. Cattle reacting to the test, but not showing clinical symptoms, shall be permanently marked in the right ear with the letter "T" by the officer making the test, and may then be released at the expiry of the prescribed period of quarantine if found free from all other infectious or contagious diseases. Cattle showing clinical symptoms of tuberculosis shall be destroyed or otherwise disposed of as the Minister may direct.

The expenses of feeding, treating, and providing for animals detained in quarantine, with the exception of those for the use of grounds and shelters, shall be borne by the owner or importer.

Animals for Exhibition.—Animals, other than swine, may be admitted for purposes of exhibition only, on inspection at the port of entry, subject to the usual Customs Regulations.

Jamaica.—According to The Animals Contagious Diseases Laws, 1890–98, all horses, cattle, sheep, goats and swine from the United Kingdom (and some other places) which the consignee shall declare in writing to be imported into Jamaica for breeding purposes only, shall, on arrival, be examined by the inspector, who is empowered to cause the slaughter of any animals found to be diseased. If found free of disease, such animals may be imported without having to undergo quarantine.

If it is uncertain whether the animals are free of disease, they are to be taken, with the consent of, and at the expense and risk of the consignee, to an appointed place of quarantine, and there detained until the inspector certifies that they are free of disease, and in his judgment not calculated to introduce disease.

If the consignee does not enter into such an agreement, the animals shall be treated as foreign animals and shall be placed in quarantine for a period of not less than fourteen days, and not be released until the inspector certifies them to be free of disease and not calculated to introduce disease.

Isle of Man.—According to a proclamation dated 29th January, 1907, any person desiring to import swine into the Isle of Man

from the United Kingdom shall make an application to the Chief Constable of the island at least seven days before the date of importation. Such application must contain a statement of the ages, colour, sex, appearance and condition of the swine, and must be accompanied by an affidavit from the person whose property the swine have been during the previous three months that they have not been in contact with any swine affected with swine fever during the preceding six months.

No swine may be imported without the written permission of the Chief Constable, and the importer must give twenty-four hours' notice, in writing, to the collector of customs and the Chief Constable, of the port at which he proposes to land the swine, and of the boat by which he proposes to import them.

Sheep Dipping (Ireland) Order.

The Board of Agriculture and Fisheries desire to call the attention of agriculturists in Great Britain generally and of persons engaged in the trade in sheep from Great Britain to Ireland in particular, to the requirements of the Sheep Dipping (Ireland) Order of 1907, recently made by the Department of Agriculture and Technical Instruction for Ireland, which affect the trade in question. Article 6 of the Order provides that during the prescribed dipping period, viz., from the 15th June to the 31st August, inclusive, sheep cannot enter, or be exposed for sale in, any market, fair or saleyard in Ireland unless accompanied by a declaration made by the owner of the sheep or his agent on a prescribed form, that they have been dipped during that period in an approved sheep dip. In the case, however, of sheep exposed for sale during the first twenty-eight days of the prescribed dipping period, this requirement will be satisfied if the declaration indicates that they have been dipped within twenty-eight days preceding their movement to the market, fair, or saleyard.

As the above requirements apply equally to sheep which may be taken from Great Britain for the purpose of exposure for sale in Ireland, persons engaged in the cross-channel trade should put themselves in a position to obtain the requisite declaration to accompany the sheep on their entry to the

market, fair, or saleyard in Ireland. Forms of declaration can be obtained from the respective local authorities in Ireland in whose districts it may be proposed to expose sheep for sale. Article 7 requires that, in order to comply with the requirements of the Order as to dipping, a sheep shall have been clipped also during the current year, previously to being dipped. This provision does not, however, apply to lambs less than nine months old.

Communications or inquiries respecting this Order should be addressed direct to the Secretary, Department of Agriculture and Technical Instruction for Ireland, (Veterinary Branch), 13, Upper Merrion Street, Dublin.

Pig Breeding in Russia. Opening for British Stock.

Pig breeding is attracting a good deal of attention at present in Western Russia. Mr. Consul-General Murray states that the demand for pig products, particularly bacon, for export to Germany and the United Kingdom is on the increase, and the peasant owners of small farms, into which larger estates are continually being broken up, find pigs both easy and profitable to keep. In 1906 the local demand for pork was at one time so much in excess of the supply, that permission was given as an exception for 6,000 head of swine to be imported from Roumania for killing.

The local pig is in need of considerable improvement, and for this reason attention is being given to the best cross to introduce to improve the breed and the best way to do so. In the spring of 1906, the Warsaw Agricultural Society appointed a commission to investigate the present position of pig breeding in Poland with a view to establish an export trade in bacon suitable for the British market, and in June three members of the society were delegated to proceed to the United Kingdom and Denmark to visit bacon factories and report on this industry. Their report has not yet been published, but in consequence of the publicity given by the society to the possibilities of this trade, a large number of estate owners have lately imported breeding animals from the United Kingdom, and several schemes are on foot to establish bacon export factories in Poland.

As a great many more breeding animals will be required in

future to produce good bacon pigs, especially of the large white Yorkshire type, Mr. Murray suggests that British pig breeders might send their catalogues and prices of pedigree pigs to the various agricultural societies in Poland, the addresses of which are simply "Towarzystwo Rolnieze," with the name of the Government, "Lublin," "Kalisz," &c., as the case may be.

The "Score Card."

In a recent number of this *Journal** attention was drawn to the value of the score card as a means of assisting students to appreciate the good qualities of an animal. This method of instruction has long been in use in America, where judging live stock is a more important feature at the agricultural colleges than it is in this country. A bulletin† issued by the United States Department of Agriculture on the subject of the score card states that "instruction in the principles of stock judging demands a very large share of the teacher's time." The aim, it may be mentioned, is not to train men to act as judges, but merely to give instruction in the fundamental principles on which the student, as the years give experience, can build an accurate knowledge of the animal form. The first essential is to lead the beginner to see correctly—to know what faults or merits each point of the animal presents to the eye or touch, and secondly, to attach a comparative value to different qualities. This is more easily done by a printed statement of the various points, with a scale for marking, than it would be by merely verbal instruction.

A score card for milch cows, which has been prepared by Mr. K. J. Mackenzie, of the South Eastern Agricultural College, will show the way in which these cards are drawn up.

This system of instruction has been applied in the United States to light and heavy horses, beef, store, and dairy cattle, bacon pigs and porkers, sheep and poultry, and also to judging dressed carcases. Many of the American Breeders Associations have a similar scale of marks assigned to the different points of their respective breeds, not for the use of judges, but for the guidance of breeders.

---

* *Journal*, November, 1906, p. 452.

† Bulletin No. 76, Division of Animal Industry.

MILCH COW, SCORE CARD.

	Name or Description of Cow..	Max. Points.	Student's Estimate.	Instructor's Estimate.
	Weight and Age			
	GENERAL APPEARANCE:			
	Temperament, active, yet quiet to handle	5		
	Form, distinctly feminine, lighter in fore-end than in flank or quarter	3		
25%	*Quality and Touch.* Skin soft, moderately thin, very flexible and elastic (handle over the paunch). The whole animal covered with soft fine hair ... ... Skin of an unctuous, oily nature, denoting butter fat.	9		
	Action, head slightly raised and gracefully carried when walking, movement free from sweeping motion and active	3		
	Legs, not too long, bone fine, and joints true	5		
	UDDER, MILK VEIN, AND ESCUTCHEON: (All four quarters sound, otherwise disqualifies.)			
	An easy milker	2		
	The Bag, carried well forward, extending well up and wide behind	4		
	Teats, wide apart and equidistant from each other, equal in size, well shaped, and of moderate length ...	2		
23%	*The whole Udder* showing great capacity	4		
	Quality, soft and mellow to the touch, covered with loose, elastic, velvet-like skin, showing the veins ...	6		
	Milk Veins, large, prominent, and branched	2		
	Escutcheon, wide at thighs, and fine hair running up vertically. Above the hind speens showing two oval patches of down-growing hair	3		
	HEAD AND NECK:			
	Horns, fine and waxy, and gracefully curved. A yellow base indicating quality of milk			
	Face, moderately long, clean cut, and lean, wide across forehead			
6%	*Eyes*, bright and prominent, yet showing gentleness and intelligence	4		
	Nose, healthy, with large sensitive nostrils			
	Ears, fine and mobile, well fringed with hair. Inside of ear yellow			
	Neck, long (compared with beef animals), fine at its junction with the head, and spreading out gracefully to meet the shoulders	2		
	FOREQUARTERS:			
	Chest, deep, showing plenty of room for heart and lungs	5		
	Brisket, prominent, Dewlap fine, with little loose skin	1		
12%	*Shoulders*, well laid back, fine, close at the points ...	3		
	Narrow at the chine	3		
	BODY:			
	Back, wedge-shaped when seen from above, of good moderate length	5		
18%	*Ribs*, well sprung and deep	4		
	Abdomen, very capacious, but not baggy or unsightly .	6		
	Flank, deep and firm to the touch	3		
	HINDQUARTERS:			
	Hips, wide apart and neat (a hollow between spine and point of hips is desirable for milk)	3		
	Quarters, long	4		
16%	*Pin Bones*, far apart	2		
	Tail, put on level with the spine, fine and tapering to a point, and showing a good tassel	2		
	Thighs, sinewy, long, thin, and well bent	5		
	Total	100		

Advantage is taken of the educational facilities afforded by the agricultural shows, and the students not only watch the judging in the ring, but go round the shows under the guidance of an instructor and have the points of the animals explained to them. At the Chicago Live Stock Exhibition prizes are given for the judging of live stock by students (See *Journal*, May, 1906, p. 103).

Investigations into the Variations in the Quality of Milk.

An investigation into the fat-content of milk has been carried out in Sweden by Herr Högström in connection with a herd of pure-bred and improved Ayrshires. The investigation extended over eight years, and represented results from 393 animals and from 18,439 milk tests. It deals with many phases of the question of the variations in the quality of milk, and the following is only a very brief summary of some of the different points.*

Monthly Variations.—The average percentage of fat in the milk over the whole period was 3·68, but the average for each month showed considerable variation. Starting from 3·70 in January, it fell fairly steadily to about 3·50 at the beginning of June, it then began to rise until towards the end of July, when it again reached 3·70 per cent., and continued to rise till the end of November, when it stood at about 3·83, after which it again declined.

Effect of Age of Cows.—The richness of the milk is shown to be related to the age of the cows, as the milk over the whole lactation period of 94 three-year-old cows averaged 3·83 per cent. and of 150 four-year-olds 3·74 per cent.; thereafter, up to the tenth year there was not much variation and the general average of a large number was 3·67 per cent. In the same way there was not much variation in the quality so long as the yield was fairly normal (400–600 gallons), but with a lower yield the fat-content was high and the reverse with a higher yield.

Variation during the Lactation Period.—It was found that at the beginning of the first month after calving, the milk averaged

---

* *Kungl. Landtbruks-Akademiens Handlingar och Tidskrift.*, Nos. 3 and 4, 1906; summarised in *Mitt. der Deutschen Land.-Gesellschaft*, 24th Nov. and 8th Dec., 1906.

3·75 per cent. of fat, but rapidly decreased and reached its minimum (3·50 per cent.) in the third month, it then rose steadily till the close of the lactation period (4·14 per cent. in the eleventh month), being above the average from towards the middle of the sixth month. The variation, in Herr Högström's opinion, undoubtedly represents a natural adjustment, both as regards quantity of milk and its fat-content, to the needs of the growing calf.

Effect of Season of Year.—In order to trace the influence of the season of the year on the variations in the milk, a number of records from cows calving in each successive month of the year was taken, in such a way as to eliminate the variations due to the progress of the lactation period, with the result that a very marked fall was shown to take place from April (3·72 per cent.) to June (3·45 per cent.) from which date it rose to a maximum in October (3·96 per cent.), when it again declined.

These two factors, viz., the variation in the lactation period and the seasonal fluctuation, are considered to have a great influence on the quality of the milk. For instance, in the case of a cow calving in March, the third and fourth months after calving, when the milk has the smallest proportion of fat over the whole lactation period, coincide with the period May-June-July, when the seasonal influence also causes the milk to be the poorest. On the other hand, in the case of a cow calving in August these two factors work in opposite directions. The minimum point in the lactation period then occurs in October, when the seasonal influences tending to raise the fat-content are at their maximum.

It is regarded as improbable, however, that the monthly variations are due merely to the external influence of the seasons or changes of temperature, and still less to changes in food. Herr Högström considers it far more likely that the cause is to be found in the organism of the animal itself, and suggests that it is related to the natural tendency of cows to calve in March or April, the quality of the milk being adapted to the requirements of the calf and the season of the year. When cows calve at other times of the year there is still a tendency to produce milk of the quality related to the time of year.

A large number of records of cows were examined with refer-

ence to their total production in relation to their calving time, from which it would seem that cows calving in March gave the highest milk yield, and also the largest quantity of fat, and in general that summer calvings, from May to September, gave the poorest results, whilst the remaining months, from October to April (with the exception of November) gave the highest yields, both in milk and in butter-fat. These gave the following results :—

Number of Records.	Month of Calving.	Total Milk Yield in the Lactation Period.	Percentage of Fat.	Actual Quantity of Butter Fat.
		Litres.		Kilos.
79	January	2,285	3·68	84·2
57	February	2,256	3·68	83·0
61	March	2,342	3·74	89·7
56	April	2,287	3·70	84·6
71	May	2,183	3·61	78·9
69	June	2,176	3·69	80·3
79	July	2,176	3·71	80·8
81	August	1,991	3·76	74·9
82	September	2,082	3·78	78·8
78	October	2,288	3·60	82·4
100	November	2,087	3·65	76·3
78	December	2,330	3·65	84·9

From the information collected in the course of the investigation, an attempt is made to trace the effect of heredity, and more particularly the influence of the bull on the milk yield of its offspring. This was done by comparing the milk yield of a number of heifers got by the same bull with the milk yield of their respective dams, a number of corrections, based on the foregoing investigation, being made to make the two sets of figures as comparable as possible in respect of age, date of calving, &c. It was found that in the case of fifty-five heifers got by the bull "Bill" the average fat content of their milk was 3·77 per cent. compared with 3·57 per cent. for the milk of their dams. Twenty-one heifers by the bull "Malte" also showed a fat content in their milk of 0·24 per cent. more than their dams (3·76 per cent. against 3·52 per cent.), and similar results were shown by twenty-one heifers by the bull "Ossian." One bull was shown to have exercised a reverse effect, five heifers produced by him giving 0·45 per cent. less fat in their milk than their dams.

Messrs. Walker-Tisdale and Theodore Robinson have furnished the Board with the following note on this subject* :—

Quick Method of Making Devonshire Cream.

In many dairies, particularly in large ones, where the sale of clotted or Devonshire cream is considerable, a quick method of producing this article is employed.

Instead of the preliminary setting up of the milk in pans for twelve or twenty-four hours, as the case may be, in order to allow the cream to rise, the milk is passed through a separator. The separator is regulated to take off thick cream, and this cream is then run gently on to the surface of some separated milk contained in tinned or enamelled iron pans. Scalding is then carried out in the usual manner, not less than half an hour being occupied by the heating process. The pans are then rapidly cooled, and the cream obtained in a thick clotted condition. Where there is a separator this is a very good way to make clotted cream, especially in summer, when it may always be obtained sweet. In hot weather, if the milk has to stand for several hours for the cream to rise, there is a danger of souring taking place.

Circular to Makers of Milk Churns.

In a circular letter dated February 27th, 1907, the Board of Agriculture and Fisheries direct the attention of makers of churns for the carriage of milk by rail to the fact that the Metropolitan Borough Councils Association, in a report which was forwarded to the Board on June 19th last, recommended that the use of sealed cans for the transit of milk should be enforced by Statute, and that at a Conference held between the Public Health Committee of Wandsworth and dairymen and keepers of milkshops in that borough on July 17th last, it was resolved : "That the Board of Agriculture be urged to take steps to ensure the carriage of milk in sealed churns." Both the report and the resolution have received the support of numerous Metropolitan Borough Councils. Two of the principal Dairy Farmers' Associations have also for several years recommended their members to send milk by rail, in sealed churns, to prevent pilfering.

* See *Journal*, vol. xiii, p. 210, July, 1906, "Devonshire Cream and Soft Cheese-making."

The railway companies do not object to carry milk in sealed churns provided the tare weight is stamped on the outside of the churn.*

The withdrawal of milk from a churn may expose the consignor to risk of prosecution under the Sale of Food and Drugs Acts, for selling milk from which fat has been abstracted; inasmuch as the cream may have risen before the withdrawal took place, or, as in some instances, which have been brought under the notice of the Board, milk may have been stolen and water added to make up the quantity. In these circumstances, the Board suggest that the following points should be kept in view in connection with the construction of milk churns :—

(1) The churn should have the tare weight stamped on the outside. (2) The lid of the churn should be constructed so as to facilitate sealing. (3) The churn should be constructed so as to prevent, as far as possible, the removal of milk from the churn while sealed. (4) The churn should be constructed so as to prevent water being added to the milk in the churn while sealed. (5) The churn should be constructed so as to prevent dust or dirt from being blown or washed into the churn when the lid is affixed.

Effect of Grass on Apple Trees.

The difference in the results obtained from apple trees grown in grass and apple trees grown on cultivated land has been referred to on several occasions in this *Journal*.† In the experiments at the Woburn Fruit Farm trees grown in grass were scarcely bigger five years after planting; similar results followed the grassing over of pears, cherries and plums immediately on planting, the check given to them being very severe. A comparison of the yields obtained in New York State from apple orchards, in grass and cultivated respectively, showed over an average of four years that the tilled orchards gave a uniformly larger yield than those in grass.

These results are supported by some tests carried out at the

* See Leaflet No. 110, "Carriage of Milk by Rail in Locked Cans."

† See *Journal*, vol. vii, p. 345, December, 1900. Vol. xii, p. 492, November, 1905, and p. 558, December, 1905.

Harper Adams Agricultural College.* Twenty-four apple trees were planted in January, 1905, and the growth in 1905 and 1906 has been compared. The grass land in which the trees were planted was manured regularly with farmyard and artificial manure, the grass mown and removed, while special artificial manures were used in the cultivated portion for each crop, in addition to farmyard manure, thus obtaining equal conditions as to manure for the trees on both plots. The trees were measured at a distance of 4½ ft. from the ground, with the following results :—

Variety of Apple.	Average Diameter in Inches.			
	Grass.		Cultivated Ground.	
	1905.	1906.	1905.	1906.
Bismark	1·03	1·05	1·31	1·62
Bramley's seedling	0·78	0·81	1·20	1·50
Cox's orange pippin	0·82	0·86	1·11	1·40

These results show that while the stems of trees in grass have increased only 0·03 in., in diameter, those in cultivated ground have increased 0·3 in., the proportion in favour of cultivated land being 10 to 1.

Destruction of Slugs and Snails.

A question of considerable importance to farmers and gardeners is how best to guard against the attacks of slugs and snails. This subject was dealt with in the Board's *Journal* for January and February, 1905 (Leaflet No. 132), but the following further information, taken from *The Agricultural News*, (Barbados, February 9th, 1907) may be found useful :—

"The following, taken from Circular 53 of the *Comision de Parasitologia Agricola*, Mexico, 1906, indicates some of the methods that have been found useful in dealing with snails and slugs which are at times a serious pest in that country :—

"The collection of snails by hand has been tried and found successful. The best times for the practice of this method are at the beginning and the end of the rainy season.

* Joint Report on Field Experiments for 1906.

"Pieces of board smeared with fat on the underside are laid down in infested places, with room beneath for the snails to collect. Cabbage leaves with rancid butter on one side, melon rinds, and the leaves of the common acacia are useful in attracting the snails.

"For trapping slugs a very useful trap may be made of earthern flower-pots provided with a cover and having a row of holes round the middle. These pots are sunk into the ground so that the holes come about at the surface. The inside of the pot is smeared with beer, a small amount of which is put into a dish at bottom.

"Another useful trap is made of a cone of galvanised iron, with many perforations, which is sunk into the ground, leaving only the top row of holes above the surface. Pieces of potato, carrot, and apple have been found to be attractive baits in this trap.

"When snails and slugs have been trapped, they may be killed by being left for five hours in a 5 per cent. solution of copper sulphate in water, or a 2 per cent. solution of lime in water.

"These pests may be kept away from a nursery or garden plot by means of a rope of twisted grass or fibre soaked in a 10 per cent. solution of copper sulphate and stretched around the border. Bands of cloth soaked in this solution and fastened around the trunks of trees may be used to prevent the ascent of slugs and snails, while a solution of iron sulphate, 25 per cent. to 50 per cent., applied in a ring 4 in. wide around the trunk of the tree, is said to stop the passage of these small animals. They may be killed in weeds, hedges, &c., by spraying with a 1 per cent. to 4 per cent. solution of copper sulphate or a 1 per cent. solution of common salt.

"Snails and slugs are eaten by geese, and the species of one genus of carnivorous snails (*Glandina*) are known to attack those that feed on plants."

The American Gooseberry Mildew.

During the winter of 1906–7 the presence of the American gooseberry mildew (*Sphærotheca mors-uvae*) in certain gardens in Worcestershire has been definitely confirmed, and the cases investigated under the auspices of the Worcestershire County Council. The reports which have been sent to the Board of Agriculture and Fisheries show that the extent and seriousness of the disease are much greater

than was at first supposed, and in view of the increased danger of infection which arises when the mildew passes into its summer stage, the Board think it desirable to issue a further warning to all fruit-growers, nurserymen, gardeners, and other growers of gooseberries.

No reports of the presence of the disease elsewhere than in Worcestershire and Gloucestershire have been confirmed, but as it is abundantly clear that the mildew has been present in certain centres in these counties for three or four years, and has spread to many adjoining gardens among which must be included some nursery gardens, it is only too probable that it will be found in other districts as the spring advances. All gooseberry growers are therefore advised to watch the plants closely during the summer months, especially those bushes which have been recently bought, in order that the disease may be detected and dealt with at the earliest possible moment. The evidence that has been collected in Worcestershire shows that in most cases it is only the young shoots that have been attacked, and that generally, though not always, the disease has appeared in low-lying damp situations. The attention of gooseberry growers should therefore be directed chiefly to the damper places and to the young wood.

All gooseberry growers who have the least reason to suspect infection are advised to spray their bushes with a solution of liver of sulphur (potassium sulphide) from the time the leaves open until the fruit is set. A solution of ½ oz. to 1½ gallons of water is recommended for the first spraying, and the strength should be increased to a solution of ½ oz. to 1 gallon of water at the second spraying. In some climates it has been found that spraying with ½ oz. to the gallon of water has injured the leaves of the gooseberry. Growers should therefore carefully note the effects of the first spraying, and, if the leaves appear to have suffered any injury from the weak solution, the stronger solution should not be used. On the other hand, if a spray of ½ oz. to 1 gallon does no harm, the grower may resort to somewhat stronger spray-fluids. The spray should be applied at intervals of fourteen to twenty days.

It must be understood, however, that the liver of sulphur spray is recommended as a preventive, and that it cannot be relied upon to produce a cure. Should any suspicious symptoms

be discovered on the plants, in spite of these precautions, the case should at once be reported to the Board. A few slips of bushes showing the disease in its most marked form should be cut off and sent carefully packed in a strong wooden or metal box (not a cardboard box) with the report to the Board. The postage on letters and packages sent by letter post need not be prepaid. All other suspected shoots should be cut off and destroyed at once. Care should be taken to see that the light conidial spores on the bushes are not distributed by the wind to other plants, and the knife or shears used in cutting off the slips should be disinfected immediately afterwards by dipping in the spray fluid. The Board will inform the correspondent as soon as possible if the plants are affected with the American gooseberry mildew, and if so he should then take immediate steps to prevent the disease spreading.

The best means to be adopted will vary in different cases. The following are suggestions for guidance. Growers must remember that during the summer months the spores which spread the infection are very readily carried from plant to plant. They should therefore aim (1) at getting rid of all infected material as soon as possible ; (2) at destroying all leaves, buds, and fruit to which it is at all probable that infection has spread. In dealing with small bushes the best plan would be to prune off the branches one by one, to drop them into a pail, and then to destroy by fire or by steeping in a cask containing a solution of 4 oz. bluestone (copper sulphate) or 2 oz. liver of sulphur to 1 gallon of water. In the case of large bushes, it would usually be best to prune off all the young shoots and then to destroy the leaves on the lower part of the bush by employing a spray containing 8 oz. bluestone to 1 gallon of water. It would not be safe to attempt to cut down or dig out affected bushes during the summer, for in doing so workmen would probably spread the disease.

Having disposed of all diseased material and of the leaves, buds, and fruit on all plants to which infection may have spread, the grower should next spray the whole plantation with a solution of ½ oz. of liver of sulphur to 1 gallon of water. He should repeat the spraying within a week and continue it at intervals of ten days throughout the rest of the season. Spraying should be done on a dry day ; if rain should fall soon after

spraying, and the liver of sulphur is washed off, the bushes should be sprayed again as soon as they are dry.

In order to assist growers in identifying the disease, the Board are issuing an illustrated leaflet, which will be sent upon application.

American gooseberry mildew has attacked red currants in Ireland and some other countries, and there is reason to believe that it may also attack black currants and raspberries, these plants should, therefore, be kept under observation by fruit growers.

The Board would again urge upon growers the necessity of taking every possible precaution to prevent the spread of American gooseberry mildew during the summer months. From the experience of Irish and Continental growers, it would seem likely that those owners of affected gooseberry bushes who neglect to take drastic measures may incur serious losses.

Osier Cultivation in Holland and Belgium.*

The varieties of osier most commonly grown in Holland and Belgium are *Salix viminalis* (the cane osier), *Salix triandria* (Black Hollanders and similar kinds), and *Salix purpurea* (the Welsh osier). The largest yield is obtained from *Salix triandria*, then from *Salix viminalis*, the smallest yield being got from the other variety, which is used for finer basket work. They are largely grown as a distinct crop on low-lying lands near rivers and streams in the same way as in the Fen district in England. In preparing an osier plantation the land is very thoroughly worked, being dug with the spade some 20 to 30 in. deep. Wet land must be drained, as, although moisture is required, osiers will not thrive in standing water. Manure is rarely applied in Belgium or Holland. The planting of the sets takes place from the end of February to the beginning of April. Three-year-old rods are usually employed; they should be 2 or 3 yards long and well provided with buds. Some growers prefer one or two-year-old rods, and there is no accepted rule as to which is the best. Each of these rods is divided, according to its length, into several pieces. These are the sets, and should be from 1 ft. to 20 in. in length. It is recommended that they should be planted as deeply as the soil has

* Summarised from an article in *Mitt. der Deutschen. Land.-Gesell.*, 2nd Feb., 1907. The Board have published a leaflet on Osier Cultivation (No. 30).

been dug ; if it has been dug 20 in. deep or more, longer cuttings should be used. This is not with the object of forming stronger roots, but to establish the plant more firmly in the ground, and to guard against its being blown about by the wind. Three or four buds may be left above the surface, but on light soil the cuttings may be entirely covered over, as the young shoots will easily push their way towards the light.

The distance at which planting is done varies very considerably, depending on local custom and the purpose for which the osiers are to be used. If strong rods are required, to be cut only every three or four years, planting may be done at distances of 36 by 32 in., of 32 in. each way, or of about 27 in. each way. Osiers for annual cutting may be planted at distances of 24 in. by 27 in., or even closer.

During the first year the ground should be hoed and kept free from weeds. Where the sets are planted wide apart, potatoes and roots are sometimes grown between; occasionally also fruit trees are planted with them.

The cutting of the rods takes place in winter, from November to March. Sometimes cutting is done even in the first year after planting and thereafter annually until the plant is worn out. By this method, which is much followed in Belgium, thin one-year rods are obtained. If stronger rods are wanted, only some of the shoots from the young plant are removed the first year, leaving seven or nine of the strongest, which remain for two, three, or four years, according to requirements. This may be regulated to suit the demand. When the crop begins to fail the osiers are cut every year till they are exhausted. The duration of such a plantation varies considerably, according to the soil, method of cutting, &c. Where it is cut over every year it may last from twelve to fifteen years, or, at the most, for twenty years, but where cutting is done only every three or four years, it may last for fifteen to thirty years, or even much longer.

Departmental Committee on Agricultural Education.

The President of the Board of Agriculture and Fisheries, by a Minute dated 23rd March, 1907, has appointed a Departmental Committee to inquire as to the provision which has now been made for affording scientific and technical instruction in agriculture in England and Wales, and to report whether, in view of the practical results

which have already been obtained, the existing facilities for the purpose are satisfactory and sufficient, and, if not, in what manner they may with advantage be modified or extended.

The Committee will be constituted as follows:—viz., the Right Hon. Lord Reay, G.C.S.I., G.C.I.E. (Chairman), the Lord Barnard, Lord Moreton, Mr. Francis Dyke Acland, M.P., Mr. David Davies, M.P., Mr. Norman Lamont, M.P., Mr. Thomas Latham, Mr. John Charles Medd, Professor Thomas Hudson Middleton, M.A., M.Sc., one of the Assistant Secretaries of the Board of Agriculture and Fisheries, Professor William Somerville, D.Sc., Mr. Henry Staveley-Hill, M.P.

Mr. Arthur Ernest Brooke-Hunt, of the Board of Agriculture and Fisheries, will act as secretary, and Mr. Henry Leon French, of the Board of Agriculture and Fisheries, as assistant secretary to the Committee.

Prizes for Cottages and Small Holdings in Ireland.

With a view to encourage cottagers and small holders in Ireland in the proper management of their holdings, the County Committees of Agriculture are empowered to offer prizes for competition. In the cottage section the points taken into consideration by the judge in making his award are: (*a*) Cleanliness and general order of cottages and premises; (*b*) cultivation of the garden, including freedom from weeds, and well-kept fences and walks; (*c*) varieties of vegetables, fruits and flowers; (*d*) arrangement of the manure heap; (*e*) general management and care of live stock, particularly pigs and poultry, special attention being given to quality and housing; and (*f*) management of bees.

In the small farm section the points are: (*a*) Cleanliness, order and economy in the dwelling-houses and offices (including poultry-house); (*b*) judicious character of cropping, efficiency of cultivation, arrangement of manure heaps, and provision for collecting liquid manure; (*c*) cultivation of the garden, variety of vegetables and fruit trees; (*d*) general condition of land under grass, care of fences, gates, water-courses, &c.; (*e*) judicious planting of shelter-belts; (*f*) freedom from weeds, especially grass-land, stack-yards and head-lands; (*g*) cultivation of head-lands; (*h*) management and care of live stock and poultry. Special credit is given if simple accounts

of receipts and expenditure in connection with any holding entered for competition are kept and exhibited to the judge.

Competitions of this character seem well designed to stimulate interest among small holders in the proper management of their holdings, and likely to produce a spirit of healthy emulation.

Return of Agricultural Holdings in Great Britain.

Since 1903 returns have been annually obtained by the Board of Agriculture and Fisheries (in connection with the Agricultural Returns) of the number of holdings in each of four groups, viz.: (1) Above 1 acre and not exceeding 5 acres; (2) above 5 acres and not exceeding 50 acres; (3) above 50 acres and not exceeding 300 acres; (4) above 300 acres.

Prior to 1903 returns of this nature were collected occasionally, the latest being in 1895. The statistics then obtained are readily comparable with later returns, but the scope of the preceding return in 1890 was different, and the figures for the first group of holdings above-mentioned included holdings of precisely 1 acre. Consequently, an exact comparison with 1890 is not possible. In 1895, however, inquiries were made to ascertain the number of holdings of precisely 1 acre in extent at that date; and the number in Great Britain was found to be 16,709. To enable the figures of 1890 to be used for comparison, it has been assumed that the proportion of holdings of precisely 1 acre to the number of those not exceeding 5 acres was, in 1890, the same as in 1895. The return of 1890 being confined to allotments and small holdings did not include holdings exceeding 50 acres. A summary of these returns showing the figures for 1890, 1895, 1903 and 1906 for each county, has now been separately printed and presented to Parliament (Cd.–3408. Price 1½*d.*).

It is necessary to remember that the area of a holding for the purposes of these returns does not include any mountain or heath land used for grazing purposes which may be attached to the farm. In many parts of the country, and particularly in Scotland, the size of the holdings would be materially increased if these "rough grazings" were reckoned in the farm acreage.

From 1890 to 1895 the number of holdings of over 1 and not over 5 acres appears to have declined from 126,398 to 117,968,

and those of 5 to 50 acres from 236,585 to 235,481. The total reduction in the number of "small holdings" would, therefore, be 9,534 or 2·6 per cent. A comparison of the figures for all classes of holdings in 1895 and 1906 respectively gives the following result :—

	England.		Wales.		Scotland.		Great Britain.	
	1895.	1906.	1895.	1906.	1895.	1906.	1895.	1906.
(1)	87,055	80,917	10,763	10,279	20,150	18,553	117,968	109,749
(2)	170,591	166,017	30,969	31,713	33,921	34,645	235,481	232,375
(3)	106,955	109,736	18,113	18,022	22,802	23,123	147,870	150,881
(4)	15,578	14,711	443	411	2,766	2,706	18,787	17,828
	380,179	371,381	60,288	60,425	79,639	79,027	520,106	510,833

Size of Holdings :—(1) Above 1 and not over 5 acres ; (2) above 5 and not over 50 acres ; (3) above 50 and not over 300 acres ; (4) above 300 acres.

During this period the total area of cultivated land in Great Britain declined by 310,758 acres, or 1·0 per cent., and the total number of holdings by 9,273 or 1·8 per cent. The proportion of holdings of each class to the total number in 1895 and 1906 respectively, was as follows :—

Year.	1–5 Acres.	5–50 Acres.	50–300 Acres.	Over 300 Acres.
1895	22·7	45·3	28·4	3·6
1906	21·5	45·5	29·5	3·5

Whereas, therefore, "small holdings" of 50 acres and less constituted 68 per cent. of the total number of holdings in 1895, they were in 1906 just 67 per cent.

Endowment of Experiment Stations in the United States.

The value of the agricultural experiment stations of the United States has recently been recognised by Congress by an Act known as the "Adams Act," which was passed in 1906. It provides that each State and territory shall annually receive from the National Treasury a grant of money in addition to that given for the establishment and maintenance of the stations by the Act of 2nd March, 1887 (Hatch Act). The initial appropriation to each State under the Adams Act is £1,000 for the fiscal year 1906.

To this amount £400 is to be added each year for five years, after which an appropriation of £3,000 is to be made annually. Thus, in 1911, and each year thereafter, each State will receive £3,000, in addition to the £3,000 hitherto granted under the Hatch Act.

The new Act considers that the stations are thoroughly organized and equipped, and therefore has for its sole object the extension and strengthening of the experimental work. The additional funds are "to be applied only to paying the necessary expenses of conducting original researches or experiments bearing directly on the agricultural industry of the United States." The Secretary of Agriculture, in commenting in his Report for 1906 on the Act, observes that the Adams fund is thus essentially a research fund, and if properly used should produce results of the greatest and most permanent value to American agriculture. The State experiment stations have already performed service of great value. They have done much to secure radical and widespread improvements in agricultural practice; they have contributed in a large measure to the creation of a new American literature of agriculture, and made it available to every farmer; they have collected much of the material from which a science of agriculture is being formulated as the basis for the instruction of successive generations of farmers in colleges, schools and farmers' institutes. Pressure of work in other directions has limited the amount of original research, but the Adams fund will now enable development to take place in that direction. Apart from the revenue received from the National Treasury, grants are made to the stations by the respective States and by local bodies.

New Arrangements for Publishing the Journal.

The *Journal* of the Board of Agriculture will in future be obtainable direct from the offices of the Board at the following rates of subscription:—Three months, 1*s.*; six months, 2*s.*; twelve months, 4*s.*; or it may be ordered through any bookseller or railway bookstall, from the Board of Agriculture and Fisheries, or from the agents, Wyman and Sons, Ltd., Fetter Lane, E.C.; Oliver and Boyd, Edinburgh; or E. Ponsonby, 116, Grafton Street, Dublin.

Soil Maps.

There are two classes of maps issued by the Geological Survey: (1) The "Solid" maps, which show the distribution of the solid rock foundations, and (2) the "Drift" maps, which show the superficial deposits of clay, alluvium, gravel, &c., which overlie the solid formations, as well as the solid formations themselves when not so covered. The utility of these drift maps is becoming more widely known to those interested in agricultural investigation, as they are of especial value as a basis for the construction of soil maps.

The Board of Education have informed this department that, since 1901, the preparation of maps, both on the 6-in. and the 1-in. scale in England and Scotland, has been carried on so as to provide for the issue of drift editions.

For England and Wales a large number of drift maps on the 1-in. scale have been published. For Scotland, drift editions of the 1-in. sheets 13, 21, and 55 have been issued, and drift editions are being prepared of all the sheets now in progress. In the case of the 1-in. sheets prepared before 1901, where materials are available for a drift edition, the Geological Survey is working towards the publication of such maps. For coal field areas 6-in. maps were published, and on these the drift deposits were shown by stippling. The coal field 6-in. maps are now under revision, and the sheets published after revision show the drift boundary lines; copies of these sheets, showing the drifts in colour, can be obtained from the Ordnance Survey Office, Southampton, on payment of the cost of preparation.

Except as regards one or two small areas of special geological interest in Scotland, the publication of 6-in. maps is restricted in both England and Scotland to mining areas; but the manuscript 6-in. maps or the field maps of all published 1-in. sheets are available for reference or for copying at the offices of the Geological Survey, (Jermyn Street, London, S.W., or 33, George Square, Edinburgh).

Notes on the Weather.

For meteorological purposes the winter, which began on December 2nd, 1906, was concluded on March 2nd, 1907. It was characterised, as far as England is concerned, by an excess in the number of weeks of "abundant" sunshine, and an excess in the number of weeks of "deficient" warmth, as compared with the previous winter. There were also more weeks of "light" rainfall. These remarks are true also for the East of Scotland, but the reverse occurred in the West. The North Eastern District of England recorded 10 weeks out of 13 with "abundant" sunshine, and only one with "scanty," but only 3 weeks with "unusual" warmth and 6 weeks with "deficient" warmth, while 6 weeks were recorded with "light" rainfall.

With the opening of spring the records more nearly approached normal. At the end of the first week heavy rain was experienced in the North West of England, and considerable quantities of snow fell in Scotland and the North and North-East of England, but the week's record for the North-East was nevertheless "abundant" sunshine and "deficient" warmth. Other districts were mostly "moderate" in all respects. During the second week considerable intervals of clear sky were experienced in most districts, but the general character of the weather was unsettled with more or less rain or snow on almost every day. The North-East District, however, again recorded "abundant" sunshine. During the third week every district in England recorded "abundant" or "very abundant" sunshine and "unusual" warmth. In the South of England the percentage of the possible duration of sunshine was as high as 70, in England E. and N.E. 67, and in the Midlands 64. In every district, however, a temperature of 30 degrees or less on the grass was recorded in the night: on three days at Hull, four at Cambridge, three at Dunmow, two at Harrogate and Sheffield, three at Birmingham and Nottingham, four at Kew, and two at Canterbury and Portsmouth. The last week of the month was accompanied by a change in the weather, which became extremely fine over the greater part of the Kingdom. The warmth recorded was "very unusual" in every district of Great Britain, except England E., where it was "unusual." The sunshine was "very abundant" in every district of England, and "abundant" in Scotland E. During the last seventeen weeks the sunshine in England N.E. has been "abundant" for fourteen weeks. During the last week of March the temperature on the grass fell to 30 degrees or less, seven times at Cambridge, Dunmow, Nottingham, and Kew, six times at Birmingham, and five times at Canterbury and Portsmouth.

Very few observations have as yet been made by the Board's correspondents. Reports are general as to the lateness of the leafage of trees and plants. Spring cabbages very brown and seared from succession of frosts in Middlesex. Plantings of lettuce and cauliflowers suffering from frost and drought. Sowings of onions normal. Reports from W. Kent give sowings as normal, as the ground is generally in such good tilth. Fruit buds generally late. Reports from West Scotland (Argyll) state ploughing delayed by inclement weather in winter, mixed with mild rain, but sheep wintered fairly well. Reports from Derbyshire favourable. Corn well sown, and pasturage in good condition, with every indication of an abundant fruit year.

Miscellaneous Notes.

Varieties of Potatoes.—As the results of some experiments, conducted by the Agricultural Department of the University of Leeds (Bulletin No. 63), the following varieties are regarded as being well suited to cultivation in Yorkshire:—*Earlies:* Recorder, Midlothian Early. *Second Earlies:* British Queen, British Queen II, Dalmeny Radium. *Main Crop Varieties:* Duchess of Cornwall, Factor, Dalmeny Beauty, Dalmeny Regent, Wonder, Up-to-date. All these are of the Up-to-date type. Yield, cooking quality and power of resisting disease were all taken into account in making this selection.

Export of Eggs from South Australia to England.—A trial shipment of eggs was made in 1906 from South Australia to this country. The eggs, which were carried in a cool chamber, arrived in good condition and were disposed of at the average price of 10*d.* per dozen for fertile and 1*s.* 1*d.* per dozen for guaranteed infertile eggs. The Department expects to arrange for four or five shipments next season, commencing about September and continuing till December.—(*Journal of Department of Agriculture of South Australia*, January, 1907.)

Tests for Farmers' Milk in Glamorgan.—An arrangement has now been concluded between the County Council and the University College, Cardiff, whereby Dr. D. R. Abell, the Demonstrator and Assistant Lecturer in Chemistry at the College, will undertake to test milk for the percentage of butter-fat for farmers in the Administrative County of Glamorgan on payment of a fee of 6*d.* to the College for each sample tested. (See Leaflet No. 146.)

Mr. R. H. Elliott's Demonstration Farm at Clifton.—The Board are informed that the demonstration farm established at Clifton-on-Bowmont, near Kelso, by Mr. R. H. Elliott is at all times open for inspection by farmers and others who may be desirous of inspecting Mr. Elliott's system of agriculture. It will be remembered that Mr. Elliott advocates the use of certain grass mixtures containing deep-rooting plants, and at Clifton an opportunity is afforded of seeing the results obtained. A description of the method appeared in this *Journal* for December, 1901, ("Cultivation by the Use of Deep-rooting Plants"), while in the issue for November, 1905, (p. 456), the results are given of some experiments with the mixtures at Abbotsley, Hunts.

Use of Separated Milk and Starch for Calf-Feeding.—The use of separated milk, with the addition of starch to take the place of the fat removed from the milk, is being adopted on the Continent for calf-feeding. (See *Journal*, July, 1906, p. 238; "Fattening Calves in Belgium.") A preparation for converting starch into sugar, which has been tried with success at the Agricultural Academy at Bonn-Poppelsdorf, was described by Dr. Hansen at a meeting of the German Dairy Society. (Deutsche Land. Presse, 20th March, 1907). This preparation, known as "Diastolin," is a form of diastase, a substance existing in barley and oats after germination, and possessing the property of breaking up the starch and converting it into sugar. This is added to a paste made of potato starch, or to wheat, rye, or oatmeal at a temperature of about 120° F. in a proportion of 10 per cent., and about half-a-pint of this mixture used to every pint of skim milk. Calves were found to thrive very well indeed on this food, and in every respect much more satisfactory results seem to have been obtained than by the employment of pure starch.

Demand for Agricultural Machinery in Russia.—Mr. Consul-General Murray, in his report to the Foreign Office on the trade of Poland for 1906 (No. 3,745), states that the import of agricultural machinery, especially steam threshers, which are chiefly of British origin, increased considerably, but several of the principal British makers were so busy that they were unable to accept orders for prompt delivery. The demand for combined drills to sow grain and distribute artificial manure simultaneously is on the increase. A machine of British invention and make for thinning beet will probably find a demand next year. The agricultural societies, who are the largest buyers of foreign agricultural machinery, are of opinion that British makers of agricultural machinery, are, as a rule, badly represented in Poland.

Horticultural Exhibition at Dresden.—An International Horticultural Exhibition will be held at Dresden from 4th to 12th May next, under the auspices of the Saxon Government. It will include garden and hot-house plants, fruit and fruit-trees, and other branches of horticulture, and will, it is believed, afford representative examples of German gardening.

German Agricultural Society's Show at Dusseldorf.—The Show of the German Agricultural Society for 1907 will be held at Dusseldorf on the Rhine from Thursday,

June 6th, to Tuesday, June 11th. It will comprise all branches of practical and theoretical agriculture, especially live stock, dairy products and machinery.

International Horse Show at the Hague.—An International Horse Show will be held at the Hague from July 1st to 7th, 1907. There are about 40 classes open for international competition.

Dairying Exhibition at the Hague.—An International Agricultural Exhibition will be held at the Hague from the 14th to 23rd September, 1907. The Dairying Section will include butter, cheese and all kinds of preserved and sterilised milk; machines, instruments and accessories for all branches of the dairy industry; scientific instruments and exhibits; technical and scientific manuals, publications, &c.; systems of book-keeping; plans of cow-sheds and installations of machinery connected with the hygenic production of milk and other allied subjects. A copy of the programme can be seen at the offices of the board. Intending exhibitors should apply at once for forms of application to the Executive Committee of the Exhibition, 42, Brutenhof, the Hague. The fee is 10 francs for entries of butter and cheese in each class, and 1 franc per square meter of space occupied by other exhibits.

Forestry Exhibition in Gloucestershire.—The Gloucestershire Agricultural Society has arranged to hold a Forestry Exhibition on June 19th and 20th, 1907, in connection with the Society's Show at Stroud. Classes are provided for (1) A General Collection of Exhibits illustrative of Forestry, (2) for boards of different woods cut from trees grown upon land owned by the Exhibitor, and (3) for collections of portable articles made from home-grown timber.

Leaflet on Black Currant Mite.—The Board of Agriculture and Fisheries desire to announce that a new edition of their leaflet on the Black Currant Mite has been published, in which information on the treatment of this pest with lime and sulphur has been incorporated. Fruit-growers whose bushes have been attacked with the mite are advised to experiment with this process.

Recent Publications of the Board.—The following leaflets have been issued during 1907:—No. 181, Cleansing of Watercourses; No. 176, Poultry Fattening; No. 190, The Dogs' Act, 1906; No. 180, Dodder; No. 189, Insurance of Farming Stock against Fire; No. 184, Red, White and Alsike Clover; No. 18, Fertilisers and Feeding Stuffs' Regulations, 1906; No. 186, Large Larch Saw Fly; No. 142 (Revised), Calf Rearing; No. 105 (Welsh), Black Scab of Potatoes; No. 29 (Revised), Swine Fever; No. 141 (Revised), Preparation of Honey for Market; No. 154 (Welsh), Prevention and Cure of Foot-Rot in Sheep; No. 1 (Revised), Black Currant Gall Mite; No. 125 (Revised), Hessian Fly.

The second part of the Agricultural Statistics, 1906, has also been published [Cd-3372. Price 5*d.*] and comprises returns of the produce of crops in Great Britain, with summaries for the United Kingdom, and weather statistics. It is prefaced by a report, which in discussing various features of the returns, refers to the yield of straw, the date and duration of harvest, the weather of the year, the marketing of the wheat crops and other subjects. Part I of this publication [Cd-3281. Price 5*d.*] refers to acreage and live stock.

ADDITIONS TO THE LIBRARY.

Africa—

Minutes of an Inter-Colonial Conference to discuss measures for concerted action in dealing with the Locust Pest, Pretoria, August, 1906, (54 pp.). Pretoria: Government Printing Office, 1906.

Natal.—Department of Agriculture, Bull. 12. Manures in the Natal Market, Season 1906. (11 pp.) Maritzburg, 1907.

British East Africa.—Department of Agriculture, Leaflet 22, Coffee. (15 pp.) Nairobi, 1907.

Australasia—

South Australia.—Reports for 1905–6: Department of Agriculture (30 pp.), Chief Inspector of Stock (4 pp.), State Forest Administration (12 pp. + 11 plates). Adelaide, 1906.

Victorian Year Book, 1905, (691 pp.). Melbourne: J. Kemp, 1906.

Western Australian Year Book, 1902–4. (1,284 pp.) Perth, W.A.: A. Curtis, 1906.

Queensland.—Bureau of Sugar Experiment Stations. Report for 1905–6. (56 pp.) Brisbane: G. A. Vaughan, 1906.

Belgium—

Vuyst, P. de.—Le Rôle Social de la Fermière. (184 pp.) Brussels: Albert Dewit, 1907.

Canada—

Minister of Agriculture.—Dairy Commissioner, Report, 1st January, 1905, to 31st March, 1906. (157 pp.) Ottawa, 1906.

Ontario.—Department of Agriculture, Report for 1905. 2 vols. Toronto, 1906.

France—

Borssat, X. de.—Législation nouvelle sur les Fraudes et Falsifications. (179 pp). Paris: Marchal et Billard, 1906.

Annuaire des Eaux et Forêts pour 1907. (369 pp.) Paris: Lucien Laveur.

Comité Permanent de la Vente du Blé.—Manuel de la Vente co-opérative des Grains. (149 pp.) Versailles: Société des Imprimeries Géradin, 1906.

Germany—

Deutsche Landwirtschafts-Gesellschaft.—Arbeiten, Heft. 124. Forschungen auf dem Gebiete der Weinbergdüngung. (152 pp.) Berlin: Paul Parey, 1907.

Metz, H.—Innere Kolonisation in den Provinzen Brandenburg und Pommern, 1891 bis 1901. (160 pp.) Berlin: Paul Parey, 1902.

Great Britain.

McConnell, Primrose.—The Diary of a Working Farmer. (285 pp.) London: The Cable P. & P. Co., 1906.

Northumberland C. C.—Bull. 9:—Report on Trials of Varieties of Potatoes, 1906. (90 pp.)

Edinburgh and East of Scotland College of Agriculture.—Report on Potato Experiments. (15 pp.)

Durham C. C.—Offerton Bulletin 2. Further Experiments on the Feeding of Dairy Cows. (36 pp.) Newcastle-on-Tyne, 1907.

Aberdeen and North of Scotland College of Agriculture.—Report on the Sprouting of Seed Potatoes. (20 pp.) Aberdeen University Press, 1907.

Memoirs of the Geological Survey.—The Geology of the Country near Newquay. (131 pp. + 5 plates); of Falmouth and Truro and of the Mining District of Camborne and Redruth. (335 pp. + 24 plates.) London: Stanford, 1906. 3s. and 7s. 6d. respectively.

Committee of Inquiry on Grouse Disease.—Notes on the Grouse. (71 pp. + 14 plates.) [Issued for the use of Local Correspondents of the Committee.]

Great Britain—*continued.*

Curtis, C. E.—Elementary Forestry. (318 pp.) London: "Estates Gazette," Ltd., 1905. 7s. 6d.

Housman, W.—Cattle, Breeds and Management (Live Stock Handbooks, No. IV.). (270 pp.) London: Vinton & Co., 1905. 3s. 6d. nett.

Simpson, J.—The New Forestry. 2nd Edition. (220 pp.) Sheffield: Pawson & Brailsford, 1903.

Royal Commission on Tuberculosis (Human and Animal).—2nd Interim Report. Part II. Appendix, Vol. IV. Comparative Histological and Bacteriological Investigations [Cd. 3378]. (292 pp. + 8 charts.) London: Wymans, 1907. 2s. 8d.

Dogs: by well-known authorities. Edited by Harding Cox. Profusely illustrated. Vol. I.: The Terriers. (164 pp.) London: Fawcett, McQuire & Co., 1906. [Arrangements have been made for the addition to the Library of the remaining four volumes when published.]

Jebb, L.—How Landlords can create Small Holdings. (58 pp.) The Working of the Small Holdings Act. (96 pp.) London: Murray, 1907. 6d. nett, and 1s. nett respectively.

Gloucestershire Education Committee.—Swede Experiments on the Cotswolds. Report 1905. (15 pp.)

Reports from the Canadian Government and H.M. Representatives Abroad on Legislative Measures respecting Gambling in "Option" and "Future" Contracts as regards Food-Stuffs [Cd. 3,280.] (21 pp.) London: Wymans, 1907. 3d.

University of Leeds.—Report for 1905–6. (122 pp.) Leeds: Richard Jackson.

India—

Eastern Bengal and Assam.—Agricultural Branch of the Department of Land Records and Agriculture. Report 1905–6. (15 pp.) Shillong: Eastern Bengal and Assam Secretariat Press, 1906. 9d.

Central Provinces.—Department of Agriculture. Report 1905–6. (20 pp.) Nagpur: Secretariat Press, 1906. 1s. 6d.

Punjab.—Department of Agriculture. Report 1905–6. (20 pp.) Lahore: "Civil and Military Gazette" Press, 1907.

Ireland—

Pethybridge, G. H., and Praeger, R. L.—The Vegetation of the District lying south of Dublin. (180 pp. + XII plates.) [Proceedings of the Royal Irish Academy.] Dublin: Hodges, Figgis & Co., 1905. 2s.

Russia—

Yermoloff, A.—La Russie Agricole devant la Crise agraire. (349 pp.) Paris: Hachette et Cie, 1907.

South America—

British Guiana.—Government Analyst. Report 1905–6. (8 pp.) Georgetown, 1906.

United States—

Henry, W. A.—Feeds and Feeding. (657 pp.) Madison, Wis.: Published by the Author, 1906.

Bureau of Animal Industry.—Bull. 94. Investigations in the use of the Bomb Calorimeter. (39 pp.) Washington, 1907.

Bureau of Chemistry.—Bull. 101. The Lime-Sulphur-Salt Wash and its Substitutes. (29 pp.) Washington, 1907.

Bureau of Entomology.—Bull. 63. Papers on the Cotton Boll Weevil and Related and Associated Insects. Parts IV to VII. Washington, 1907.

Office of Experiment Stations.—Bull. 177. Evaporation Losses in Irrigation and Water Requirements of Crops. (64 pp.) Washington, 1907.

[Books may be borrowed from the Board's Library on certain conditions, which may be ascertained on application.]

PRICES OF AGRICULTURAL PRODUCE.

Average Prices of Live Stock in England and Scotland in the Month of March, 1907.

(Compiled from Reports received from the Board's Market Reporters.)

Description.	England. First Quality.	England. Second Quality.	Scotland. First Quality.	Scotland. Second Quality.
Fat Stock :—	per stone.*	per stone.*	per cwt.†	per cwt.†
Cattle :—	s. d.	s. d.	s. d.	s. d.
Polled Scots	7 11	7 7	37 1	33 10
Herefords	7 11	7 6	—	—
Shorthorns	7 9	7 2	36 2	33 4
Devons	8 2	7 4	—	—
	per lb.*	per lb.*	per lb.*	per lb.*
	d.	d.	d.	d.
Veal Calves	9	8	9	6¾
Sheep :—				
Downs	9¼	8¾	—	—
Longwools	9	8	—	—
Cheviots	9¾	9	9½	8½
Blackfaced	9¼	8½	8¾	8
Cross-breds	9¼	8½	9½	8½
	per stone.*	per stone.*	per stone.*	per stone.*
Pigs :—	s. d.	s. d.	s. d.	s. d.
Bacon Pigs	7 0	6 7	6 8	5 8
Porkers	7 5	7 0	7 3	6 5
Lean Stock :—	per head.	per head.	per head.	per head.
Milking Cows :—	£ s.	£ s.	£ s.	£ s.
Shorthorns—In Milk	20 7	17 8	21 8	17 9
,, —Calvers	20 17	17 12	19 13	16 15
Other Breeds—In Milk ..	21 17	13 14	18 0	14 19
,, —Calvers ...	—	13 13	19 1	15 8
Calves for Rearing	2 1	1 14	2 11	1 16
Store Cattle :—				
Shorthorns—Yearlings ...	9 11	8 2	9 6	7 13
,, —Two-year-olds ...	13 6	11 15	14 2	12 3
,, —Three-year-olds	16 10	14 16	15 14	13 15
Polled Scots—Two-year-olds	—	—	15 9	13 5
Herefords— ,,	15 2	13 10	—	—
Devons— ,,	12 14	11 0	—	—
Store Sheep :—	s. d.	s. d.	s. d.	s. d.
Hoggs, Hoggets, Tegs, and Lambs—				
Downs or Longwools ...	47 4	42 5	—	—
Scotch Cross-breds... ...	—	—	37 6	33 4
Store Pigs :—				
Under 4 months	29 11	21 10	22 2	17 8

* Estimated carcase weight.
† Live weight.

AVERAGE PRICES of DEAD MEAT at certain MARKETS in ENGLAND and SCOTLAND in the Month of March, 1907.

(Compiled from Reports received from the Board's Market Reporters.)

Description.	Quality.	London.		Birmingham.		Manchester.		Liverpool.		Glasgow.		Edinburgh.	
		per cwt.		per cwt.		per cwt.		per cwt.		per cwt.		per cwt.	
		s.	d.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.
BEEF :—													
English	1st	51	0	51	0	50	6	—		53	0*	51	0*
	2nd	49	6	46	6	46	0	—		50	0*	47	0*
Cow and Bull ...	1st	41	0	44	6	42	0	39	6	43	6	42	0
	2nd	35	0	40	6	36	6	35	0	34	0	36	0
U.S.A. and Canadian :—													
Port Killed ...	1st	52	0	50	0	48	6	49	6	49	0	—	
	2nd	47	0	45	0	45	0	45	0	47	0	—	
Argentine Frozen—													
Hind Quarters ...	1st	30	6	31	6	30	6	30	6	32	6	32	6
Fore ,, ...	1st	25	0	26	0	25	6	25	6	26	0	28	0
Argentine Chilled—													
Hind Quarters ...	1st	38	6	40	0	39	0	37	6	—		42	6
Fore ,, ...	1st	28	6	30	6	30	6	29	6	—		32	6
American Chilled—													
Hind Quarters ...	1st	53	0	51	6	50	6	50	6	53	0	53	0
Fore ,, ...	1st	33	0	34	0	33	0	33	0	36	0	36	0
VEAL :—													
British	1st	71	0	72	6	77	6	80	6	—		—	
	2nd	64	0	61	0	68	0	74	0	—		—	
Foreign	1st	74	0	—		70	0	—		—		68	0
MUTTON :—													
Scotch	1st	74	6	—		77	6	76	6	74	0	65	6
	2nd	67	0	—		73	0	70	6	62	6	58	6
English	1st	—		68	6	74	0	71	0	—		—	
	2nd	65	6	56	0	68	0	66	0	—		—	
U.S.A. and Canadian—													
Port killed ...	1st	—		—		67	6	—		63	0	—	
Argentine Frozen ...	1st	34	0	35	6	37	6	37	6	36	6	37	6
Australian ,, ...	1st	32	6	34	0	35	6	34	6	36	6	—	
New Zealand ,, ...	1st	41	0	39	6	46	0	45	6	—		—	
LAMB :—													
British	1st	107	6	100	6	121	6	112	0	—		—	
	2nd	93	6	86	6	—		—		—		—	
New Zealand ...	1st	50	0	51	6	50	0	49	0	54	6	55	0
Australian	1st	41	6	42	6	41	0	40	0	43	6	43	6
Argentine	1st	42	0	43	0	42	6	41	0	42	0	44	6
Pork :—													
British	1st	62	6	62	6	67	0	66	0	57	6	58	6
	2nd	55	6	56	0	61	0	60	0	55	6	49	0
Foreign	1st	59	6	61	0	60	0	60	0	—		—	

* Scotch.

AVERAGE PRICES of **British Corn** per Quarter of 8 Imperial Bushels, computed from the Returns received under the Corn Returns Act, 1882, in each Week in 1905, 1906 and 1907.

Weeks ended (*in* 1907).	Wheat.						Barley.						Oats.					
	1905.		1906.		1907.		1905.		1906.		1907.		1905.		1906.		1907	
	s.	*d.*	*s.*	*d.*	*s.*	*d.*	*s.*	*d.*	*s.*	*d.*	*s.*	*d.*	*s.*	*d.*	*s.*	*d.*	*s.*	*d.*
Jan. 5 ...	30	4	28	4	26	0	24	4	24	6	23	11	16	3	18	2	17	3
,, 12 ...	30	4	28	6	26	1	24	6	24	8	24	2	16	3	18	4	17	4
,, 19 ...	30	5	28	5	26	1	25	0	24	11	24	1	16	5	18	4	17	5
,, 26 ...	30	6	28	7	26	2	25	1	25	1	24	5	16	7	18	7	17	5
Feb. 2 ...	30	6	28	10	26	3	25	0	25	1	24	4	16	7	18	10	17	5
,, 9 ...	30	7	28	10	26	6	25	2	25	3	24	5	16	8	18	10	17	7
,, 16 ...	30	5	28	11	26	7	25	2	25	6	24	1	16	9	19	0	17	7
,, 23 ...	30	10	28	10	26	10	25	0	25	4	24	2	16	10	19	0	17	9
Mar. 2 ...	30	8	28	8	26	9	25	2	25	0	24	2	16	10	19	0	17	9
,, 9 ...	30	9	28	5	26	8	25	2	25	1	23	11	16	10	18	8	17	11
,, 16 ...	30	10	28	5	26	10	24	11	24	8	24	2	16	10	18	10	18	0
,, 23 ...	30	9	28	4	26	10	25	2	24	4	24	0	17	0	18	8	18	1
,, 30 ...	30	9	28	3	26	8	25	1	24	5	23	9	16	11	18	11	18	2
Apl. 6 ...	30	9	28	7	26	9	25	6	24	2	24	3	17	0	18	11	18	3
,, 13 ...	30	8	28	11			24	3	24	4			17	6	19	4		
,, 20 ...	30	8	29	4			24	4	24	0			17	5	19	1		
,, 27 ..	30	9	29	6			24	4	24	0			17	9	19	6		
May 4 ...	30	8	29	10			25	3	23	10			18	0	19	9		
,, 11 ...	30	8	30	1			24	10	24	1			18	3	20	0		
,, 18 ...	30	10	30	3			24	8	23	10			18	5	20	1		
,, 25 ...	30	11	30	4			24	4	24	2			18	8	20	2		
June 1 ...	31	3	30	4			23	6	22	10			19	1	20	5		
,, 8 ...	31	4	30	3			24	0	23	4			18	11	19	11		
,, 15 ...	31	7	30	4			26	0	23	6			19	1	20	2		
,, 22 ...	31	7	30	5			23	9	22	10			18	10	20	2		
,, 29 ...	31	8	30	3			23	2	24	3			19	7	20	1		
July 6 ...	32	1	30	2			22	11	23	0			19	6	20	2		
,, 13 ...	32	3	30	5			23	10	23	8			19	7	20	4		
,, 20 ...	32	2	30	3			23	7	23	2			18	11	20	5		
,, 27 ..	32	3	30	5			23	11	22	4			19	3	20	2		
Aug. 3 ...	31	11	30	0			22	0	22	1			18	4	19	3		
,, 10 ...	30	5	30	5			22	5	23	0			16	11	17	11		
,, 17 ...	28	5	26	6			23	4	24	2			16	4	17	6		
,, 24 ...	27	1	27	6			23	6	25	0			15	9	16	10		
,, 31 ...	26	11	26	6			23	5	24	3			15	6	16	6		
Sept. 7 ...	27	1	26	4			23	4	24	9			15	11	16	3		
,, 14 ...	26	11	25	11			23	7	24	3			16	6	16	1		
,, 21 ...	29	8	25	6			23	10	24	3			15	11	16	6		
,, 28 ...	26	6	25	6			24	3	24	8			16	1	16	2		
Oct. 5 ...	26	6	26	1			24	6	25	0			16	3	16	3		
,, 12 ...	26	11	26	3			24	10	25	3			16	6	16	7		
,, 19 ..	27	1	26	6			25	6	24	10			16	7	16	8		
,, 26 ...	27	4	26	7			24	11	24	10			16	8	16	10		
Nov. 2 ...	27	10	26	7			24	6	24	8			17	1	16	11		
,, 9 ..	28	3	26	6			24	10	24	8			17	4	17	1		
,, 16 ...	28	7	26	4			24	6	24	4			17	8	17	2		
,, 23 ..	28	5	26	3			24	6	24	1			17	6	17	3		
,, 30 ...	28	8	26	1			24	6	24	1			17	11	17	2		
Dec. 7 ...	28	6	26	1			24	7	24	1			17	11	17	4		
,, 14 ...	28	5	26	1			24	5	23	11			17	11	17	3		
,, 21 ...	28	4	26	3			24	6	24	3			17	11	17	3		
,, 28 ...	28	3	26	6			24	7	24	1			18	1	17	3		

AVERAGE PRICES of **Wheat**, **Barley** and **Oats** per Imperial Quarter in FRANCE and BELGIUM, and at PARIS, BERLIN, and BRESLAU,

—		Wheat.		Barley.		Oats.	
		1906.	1907.	1906.	1907.	1906.	1907.
		s. d.	*s. d.*	*s. d.*	*s. d.*	*s. d.*	*s. d.*
France:	February ...	40 0	39 7	25 1	26 7	22 1	22 11
	March ...	39 10	40 0	25 2	26 8	22 3	22 11
Paris:	February ...	40 4	40 2	25 2	26 10	22 8	22 8
	March ...	40 6	40 0	25 3	27 3	23 2	23 0
Belgium:	January ...	30 10	28 9	23 6	25 0	21 9	19 5
	February ...	30 11	28 5	24 4	25 3	21 9	20 0
Germany:	February ...	37 9	39 9	28 0	29 4	21 10	22 10
	March ...	37 8	40 0	27 10	29 1	23 0	24 10
Berlin:	January ...	39 10	39 2	—	—	22 10	23 11
	February ...	39 1	40 3	—	—	22 9	24 11
Breslau:	January ...	35 6	37 6	25 1	29 7 (brewing) 23 3 (other)	20 7	21 3
	February ...	35 3	37 7	25 1	29 7 (brewing) 23 3 (other)	20 8	22 5

NOTE.—The prices of grain in France have been compiled from the official weekly averages published in the *Journal d'Agriculture Pratique*; the Belgian quotations are the official monthly averages published in the *Moniteur Belge*; the German quotations are taken from the *Deutscher Reichsanzeiger*, the prices for the German Empire representing the average of the prices at a number of markets.

AVERAGE PRICES of **British Wheat, Barley** and **Oats** at certain Markets during the Month of March, 1906 and 1907.

—	Wheat.		Barley.		Oats.	
	1906.	1907.	1906.	1907.	1906.	1907.
	s. d.	*s. d.*	*s. d.*	*s. d.*	*s. d.*	*s. d.*
London...	29 4	28 1	23 7	23 9	19 3	18 10
Norwich	28 4	26 5	24 7	24 0	18 2	17 6
Peterborough	27 8	25 10	23 3	22 7	18 3	17 3
Lincoln...	27 8	26 4	24 0	23 8	18 3	17 5
Doncaster	27 10	26 2	24 6	24 2	18 7	17 11
Salisbury	28 7	26 7	25 2	23 0	19 3	17 11

AVERAGE PRICES of PROVISIONS, POTATOES, and HAY at certain MARKETS in ENGLAND and SCOTLAND in the Month of March, 1907.

(Compiled from Reports received from the Board's Market Reporters.)

Description.	London.		Bristol.		Liverpool.		Glasgow.	
	First Quality.	Second Quality.	First Quality.	Second Quality.	First Quality.	Second Quality.	First Quality.	Second Quality.
	s. d.	*s. d.*	*s. d.*	*s. d.*	*s. d.*	*s. d.*	*s. d.*	*s. d.*
BUTTER :—	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.
British ...	14 0	12 3	14 6	12 9	—	—	14 0	—
	per cwt.	per cwt.	per cwt.	per cwt.	per cwt.	per cwt.	per cwt.	per cwt.
Irish Creamery	—	—	108 0	104 0	—	—	—	—
,, Factory	94 6	88 6	98 0	95 0	91 0	87 0	—	—
Danish ...	112 6	109 6	—	—	112 6	109 0	112 6	—
Russian ...	97 0	94 0	—	—	—	—	—	—
Australian ...	98 6	95 6	102 0	94 0	98 0	95 0	101 6	97 6
New Zealand	101 0	98 0	103 6	101 0	102 0	99 0	102 6	—
CHEESE :—								
British —								
Cheddar ...	86 0	81 6	84 0	72 0	82 0	78 0	72 0	66 0
					120 lb.	120 lb.		
Cheshire ...	—	—	—	—	83 6	78 6	—	—
					per cwt.	per cwt.		
Canadian ...	67 6	66 6	68 0	66 0	66 6	65 6	67 6	65 6
BACON :—								
Irish	62 0	59 6	—	—	63 0	59 0	63 0	61 0
Canadian ...	58 0	57 6	58 6	55 0	56 6	51 6	58 0	54 0
HAMS :—								
Cumberland ...	108 0	104 0	—	—	—	—	—	—
Irish	108 6	103 6	—	—	—	—	84 0	77 6
American (long cut) ...	62 0	60 6	59 6	57 0	59 0	56 6	60 0	57 6
EGGS :—	per 120.	per 120.	per 120.	per 120.	per 120.	per 120.	per 120.	per 120.
British ...	9 7	8 6	9 2	—	—	—	—	—
Irish	9 7	8 10	9 1	8 5	9 0	8 6	9 8	9 2
Danish ...	9 5	8 5	—	—	9 3	8 6	9 7	8 10
POTATOES :—	per ton.	per ton.	per ton.	per ton.	per ton.	per ton.	per ton.	per ton.
Langworthy ...	85 0	76 0	87 6	76 0	—	—	66 0	61 0
Scottish								
Triumph ...	81 0	72 6	86 0	70 0	76 6	66 6	—	—
Up-to-Date ...	82 6	72 6	90 0	80 0	71 6	60 6	61 0	55 0
HAY :—								
Clover ...	101 0	90 0	90 0	80 0	100 0	77 6	85 0	80 0
Meadow ...	98 6	87 0	85 0	75 0	—	—	85 0	79 6

DISEASES OF ANIMALS ACTS, 1894 to 1903.

NUMBER of OUTBREAKS, and of ANIMALS Attacked or Slaughtered.

GREAT BRITAIN.

(From the Returns of the Board of Agriculture and Fisheries.)

Disease.	March.		3 Months Ended March.	
	1907.	1906.	1907.	1906.
Swine-Fever :—				
Outbreaks	177	88	475	235
Swine Slaughtered as diseased or exposed to infection ...	1,169	400	2,470	1,047
Anthrax :—				
Outbreaks	107	102	255	258
Animals attacked	144	171	346	373
Glanders (including Farcy) :—				
Outbreaks	88	103	236	286
Animals attacked	191	211	548	540
Sheep-Scab :—				
Outbreaks	80	57	345	244

IRELAND.

(From the Returns of the Department of Agriculture and Technical Instruction for Ireland.)

Disease.	March.		3 Months Ended March.	
	1907.	1906.	1907.	1906.
Swine-Fever :—				
Outbreaks	9	4	41	9
Swine Slaughtered as diseased or exposed to infection ...	167	62	734	214
Anthrax :—				
Outbreaks	—	—	—	2
Animals attacked	—	—	—	2
Glanders (including Farcy) :—				
Outbreaks	—	1	—	2
Animals attacked	—	3	—	7
Sheep-Scab :—				
Outbreaks	30	15	132	115

THE JOURNAL

OF THE

BOARD OF AGRICULTURE.

Vol. XIV. No. 2.

MAY, 1907.

PROBLEMS IN POTATO GROWING.

W. E. BEAR.

The potato crop has been a highly favoured subject for experiments in many recent years, and a great preponderance of results may be said to have settled some points in reference to its cultivation, while there are still some problems left to be solved, and others, dependent largely upon local circumstances, as to which, perhaps, no conclusions of general application will ever be warrantable.

Seed.—Among the settled points the first set calling for notice relates to the seed. Taking all varieties into consideration, it may be stated with confidence that a great majority of trials has proved that large whole sets, as a rule, give the greatest yield, but that the excess over the yield of sets of medium size is not generally sufficient to pay for the additional cost of seeding. Possibly it may be objected that this verdict does not hold good when potatoes are very cheap, and this, of course, is a consideration of some importance; but, if this objection be admitted, it points only to an exception which proves the rule. Moreover, as nearly all extensive growers of potatoes are sellers of seed, the advantage of the general planting of a size smaller than that of ware is obvious, seeing that if the use of large sets became common, potatoes of smaller size would be a drug in the market.

Another point in relation to seed which has been proved in nearly all trials is that sets sprouted in boxes are much more productive than tubers kept in clamps through the winter in the usual way. It is true that a report of a trial recently

published shows a somewhat greater yield from un-boxed than from boxed seed of a certain variety; but it is explained that the former, a very small quantity, had been packed between straw divisions in a careful manner and covered with a thick layer of straw above, so that they had made only short sprouts when they were required for planting, and then they were placed carefully in boxes without breaking off any of the sprouts. The trial, therefore, was merely one between seed sprouted in straw enclosures and seed sprouted in boxes. The preservation of the first shoots, the most important result of boxing, was equally attained in the two lots; whereas, if the unboxed seed had been kept in bulk in the common way many of its first sprouts would have been lost before the sets were planted.

The superiority of seed potatoes obtained from Scotland for planting in England to those grown more than once in the latter country has been proved beyond all question by a multitude of precise trials; but there is not yet sufficient direct evidence to confirm the common statement that a Scottish stock grown only once in the south is of equal value with seed obtained direct from Scotland. Further experience with seed from Ireland is also needed.

It is commonly asserted as beyond doubt that immature seed is superior in productiveness to mature seed; but upon what evidence the assertion is based it is impossible to say. It may be that it has been proved by private trials, or it may be based on hap-hazard observation, or again it may be the mere acceptance and repetition of the verdict of one high authority on potato growing. At any rate, only two reports of precise trials of this point have come under my notice, and in one of these the results were conflicting. It is hardly justifiable to assume that the reason why potatoes from a comparatively cold part of the kingdom do better than seed grown in the south of England is that the former are less mature than the latter. They are later in coming to maturity, no doubt; but, as they are taken up several weeks later, the statement that they are less ripe is open to doubt. Many kinds of seed other than potatoes from a district of cold climate are more robust and productive than corresponding kinds grown in comparatively warm districts, and it has not been assumed that the only difference was one of degree of ripeness. Therefore, until

proved by a sufficient number of precise experiments, the point under notice cannot be regarded as clearly settled.

Varieties.—The results of experiments with different varieties of potatoes differ greatly with localities, so that they are of little more than local value. Taking a great number into account, it may be said that no first-early variety stands out prominently as the best yielder. Among second earlies, however, British Queen still occupies a position in reference to yield and quality combined which is second to that of no other variety of its class; while Up-to-Date in this double connection has not yet been clearly deposed from its premier place, although it has been beaten in yield alone in some recent trials by some closely allied varieties such as Factor and Duchess of Cornwall, or both.

Manuring.—With respect to manuring, there is a vast accumulation of evidence in support of certain conclusions, as follows: That nearly a maximum crop can be grown with the use of about 20 tons of farmyard manure, and that the addition of artificial fertilizers to this heavy dressing, although it may increase the yield, hardly ever increases it sufficiently to prove remunerative; that at least as good a crop as a rule can be obtained by the use of half the large dressing of farmyard manure and a complete mixture of artificials containing nitrogen, phosphoric acid and potash, as by the application of the full quantity of the natural manure alone, and at less expense; that the omission of any one of the three classes of artificial manure almost invariably leads to a reduction in the yield of potatoes; that no quantities of artificials yet tried have proved of equal efficiency to the combination of natural and artificial manures, although the profit from the application of artificials alone has sometimes been the greater.

A considerable number of trials have indicated that the quality of potatoes grown with artificial manures alone is superior to that of potatoes grown with the help of farmyard manure, and this may be regarded as the rule, to which varying circumstances afford exceptions.

Spraying.—It has been fully established that spraying with Bordeaux Mixture, particularly when done two or three times in a season, reduces the percentage of disease as a rule when there is any. It is also commonly believed to increase the yield by prolonging the life of the haulm, at least, so far as the main crop of

potatoes is concerned. The operation does not appear to be generally deemed necessary for first-earlies, and my own trials on second-earlies in three seasons throw doubt upon its remunerativeness in a district in which the crop is ripe early in August.

To cite all the evidence upon which these conclusions are based, derived as it has been from reports of experiments carried out in all divisions of the United Kingdom during a long course of years, would fill the present volume. If it could be given even in summary form, it would fully justify the confidence with which the conclusions are recorded.

Sub-soiling.—Turning now to problems which, in my opinion, cannot be said to have been solved finally by the results of precise experiments, allusion may first be made to the preparation of the soil for potatoes, in reference to which there is an astonishing lack of distinct evidence. The common practice of good growers, no doubt based on the experience of generations, is that of ploughing deeply in the autumn, cross-ploughing in the early part of the following year, the time being determined by the condition of the soil, and cultivating and harrowing just before planting time, whether the land is to be ridged or not, as it usually is in England and Scotland. So far as noticed, the only writer besides the present one who has recommended subsoiling for potatoes is Mr. Findlay, the noted raiser of new varieties and a remarkably successful grower on an extensive scale. In his little book on "The Potato: Its History and Culture," he objects to the common impression that, if the land is loosened by cultivation to the depth of six or eight inches, the requirements of the potato plant are met, as it is regarded as a surface-rooting plant. So far from this being all that is necessary, he says, he has found by experience in connection with his experimental plots and by observation where deep cultivation is practised, that the extra yield is out of all proportion to the cost of such deep culture. He recommends deep cultivation, not by turning the under soil uppermost, but by subsoiling in the autumn. It may be added that the difference in the crops of last season on adjoining pieces of land, one subsoiled and the other not so, was astonishingly great in favour of the former. It is strongly to be recommended, therefore, that experiments on various classes of soil should be made with subsoiling.

Cross-ploughing.—Another question requiring to be tested is the advantage or disadvantage of cross-ploughing land for potatoes in February. It is probable that this operation is beneficial on the best potato soils, which are of a friable character, provided that the land is fairly dry when it is carried out. But where the land is at all heavy, there is good reason to question the advantage of ploughing a second time in the latter part of the winter or in the early part of the spring. In most heavy-land districts experienced farmers are averse to such ploughing for spring corn or mangolds, because soils containing much clay are never in so finely divided a condition and accordingly so drought-resistant as when they are ploughed finally in the autumn, and worked only by cultivators and harrows in the spring. It is true that occasionally when drought follows a wet period in the spring, before the land is sown, it has been first "run together" and then dried into a compact mass which no implement but the plough will break up satisfactorily. In such a case ploughing is adopted as the less of two evils, but only so.

To say the least, it is not obvious why a practice avoided on heavy soils as far as possible for spring corn or mangolds should be advantageous for potatoes. Unless hard frost follows the cross-ploughing done in February or early in March, retentive soils are apt to prove cloddy when cultivated for potato-planting, and consequently to let a possible drought penetrate to the depth cultivated when the crop is growing.

It is further to be observed that the relative advantages on different classes of soil of growing potatoes in drills and on the flat respectively have not been tested by any considerable number of trials, so far as can be determined by public reports.

Maturity of Seed.—As already incidentally indicated, the assertion that immature seed is of superior productive power to mature seed needs to be tested by a good number of precise experiments. There are certain considerations which appear to tell against this assumption. It will not be questioned that potatoes of seed-size are usually less mature than the full-sized tubers from the same crop, and yet the latter are commonly the more productive, although not the more profitable to use as seed, unless when potatoes are very cheap. Again, during the past season, seed from Ireland proved more productive than seed from Scotland in several

trials, and this superiority—which in itself needs to be further tested—can hardly be due to greater immaturity, if that characteristic be attributable to growth in a colder climate, unless all the Scottish seed came from the south of Scotland, and all the Irish seed from the north of that country, which is improbable. If Irish seed generally be really less mature than Scottish seed, it must be so in consequence of the greater dampness of the Irish climate, and not on account of greater coldness.

But, as a matter of fact, is Scottish seed less mature than English, and is Irish seed less mature than Scottish? The question should be answerable by the careful examination of a number of samples. So far as premature sprouting may be regarded as a test of immaturity, my own experience is that seed grown on my farm, and taken from a crop raised just after the skins of the tubers were fully set, was much less mature than seed obtained from Scotland, and yet the latter gave a much greater yield in several trials.

The best test of the point at issue yet made public was carried out for the University of Leeds and the Yorkshire Council for Agricultural Education last season. Seed from portions of a crop raised when the haulm was quite green and the skin of the tubers tender in 1905 was tried in 1906 against seed from portions of the same crop raised after the tops were quite dead and the skin of the potatoes had become tough. The yields of two varieties of boxed mature seed were 12 tons 10 cwts. and 11 tons 11 cwts. per acre respectively, while those of boxed immature seed of the same varieties were 11 tons 5 cwts. 3 qrs. and 11 tons 14 cwts. Again, unsprouted mature seed of one of the two varieties yielded 10 tons 12 cwts. 1 qr., against 9 tons 2 cwts. 1 qr. obtained from unsprouted immature seed. In a similar trial carried out in the preceding season, whole sets of two varieties showed an advantage to immature seed and one variety a disadvantage; while with cut sets two results out of three were in favour of mature seed.

Potato Scab.—The report giving these results also describes the results of experiments for the prevention of scab in potatoes, a problem requiring further elucidation. It had been noted that the disease was more prevalent in light than in heavy soils and in dry than in wet seasons. Therefore, various substances which tend to increase the water-holding capacity of a soil were applied to land

notably liable to produce scabby potatoes, comprising shoddy, peat moss litter, sawdust, and rape meal, each alone and with salt. The only successes were with 53 cwts. of sawdust per acre sown over the sets at planting time with and without 5 cwts. of salt, and with a ton of wet peat moss and salt. The sawdust alone checked the disease, and the addition of salt rendered the potatoes practically free from scab, although those on untreated portions of the field were badly affected. The wet peat moss and salt proved equally successful, yet abundant experience shows that drought alone will not develop scab, and in all probability it is some deficiency in the constituents of a light and gritty soil which causes it to foster the development of the disease. Further investigations into the cause of this disfiguring malady would seem desirable. Some information respecting it is given in the Boards' Leaflet, No. 137.

Manuring.—Turning to unsettled problems of manuring, attention may first be directed to some striking results from different methods of preparing and applying farmyard manure, shown in a report by Mr. R. A. Berry, Lecturer on Chemistry at the West of Scotland Agricultural College on experiments carried out at Kilmarnock by Professor Wright, Principal of the College. It has been the fashion of late to recommend the application of this manure to a field intended for potatoes in the autumn, spreading it all over the land, and ploughing it in at once. At Kilmarnock this plan was tried in comparison with the method of leaving the manure spread on the land three months before ploughing it in, and with that of applying it in the potato drills just before planting in the spring. The experiments were on a rotation of crops of which the potato crop was the first, and the total yields per acre of large plots (one-fortieth of an acre each) unmanured and dressed with 20 tons of fresh farm manure applied variously, as above described, were as follows :—No manure, 8 tons 18 cwts. ; manure spread in the autumn and ploughed in at once, 11 tons 18 cwts. 1 qr. ; manure spread in the autumn and not ploughed in for three months, 10 tons 17 cwts. 3 qrs. ; manure applied in drills in the spring, 14 tons. 3 cwts. 1 qr. The great superiority of the last plan of application is, no doubt, attributable partly to loss of nitrogen incurred by the manure on the other plots in the autumn, and partly to the concentration of the manure in the drills under the seed potatoes as a source of food for the

plants and a preservative of moisture. The advantage was attained, moreover, without any disadvantage to the succeeding crops of the rotation, the wheat crop having been practically equal to that of the better of the other two plots, the seeds hay crop nearly equal on all three, and the oat crop greatly superior on the plot manured in its drills in the spring.

In the same trial the 20 tons of fresh farmyard manure applied in the drills were tested against the residues of two lots, each of the same original quantity of 20 tons, rotted respectively in the field and under cover, and applied in the drills. The yield from the manure rotted in the open was 1 ton 5 cwts. per acre less than from the fresh manure, and that of the manure rotted under cover was 10 cwts. 2 qrs. less. With respect to this comparison, it is to be observed that farmers know perfectly well that there is a waste in rotting manure, and they incur it for the sake of destroying the vitality of weed and hay seeds in it. If the same quantity of rotted as of fresh manure had been applied in the drills, the comparison might have had an entirely different result.

If there had been any comparison of the quality of the potatoes grown with fresh and rotted manure respectively, it is probable that the latter would have proved superior.

In reference to the quality of potatoes in relation to the manures used for them, further investigation is needed to confirm or refute the common statement that nitrate of soda, as compared with sulphate of ammonia, and muriate of potash or kainit, as compared with sulphate of potash, are injurious to quality.

Such an investigation, at the same time, would throw light upon the relative productive qualities of these rival manures, if carried out in a large number of places, although uniformity of results could not be expected, because variations in both soils and seasons would lead to diversity. As a rule, nitrate of soda gives its best results in a dry season, and sulphate of ammonia in a wet one; but this cause of conflicting evidence would be obliterated by experiments conducted for a moderately long series of years. The comparison has been made in some experiments, but only in comparatively few. It is not improbable that nitrate of soda, as the more quickly acting manure, would prove usually superior as to yield for first and second-earlies, while the more gradually operative sulphate of ammonia might be expected to show the best results in late crops.

The two nitrogenous manures were tried against each other in two fields on my farm last season, with conflicting results, as follows :—

Manures.	Total Yields per Acre. Field 1. Tons	cwts.	lb.	Field 2. Tons	cwts.	lb.
4 cwts. superphosphate ... ... 2 ,, muriate of potash ... ... 2 ,, sulphate of ammonia	5	13	12	11	1	57
4 ,, superphosphate ... ... 2 ,, muriate of potash ... ... 2 ,, nitrate of soda	5	8	17	11	11	73

It will be observed that equal quantities of the two nitrogenous manures were used, the nitrate of soda containing the smaller percentage of nitrogen and costing less than the sulphate of ammonia. If the quantities had been adjusted to those of nitrogen, it is probable that the nitrate would have come out best in both fields, instead of in only one, as the potatoes in both were second-earlies—British Queens.

A great many trials of equivalent quantities of the three ordinary potash manures have been published, and whereas in nearly all kainit has come out lowest, results in relation to sulphate and muriate of potash have been conflicting. In two of my own fields last season, and in one field in 1905, muriate of potash proved greatly superior to sulphate, when used in equal quantities with superphosphate and sulphate of ammonia, as shown below :—

Manures per Acre.	Total Yields per Acre. 1905. Tons	cwts.	lb.	1906. Field 1. Tons	cwts.	lb.	1906. Field 2. Tons	cwts.	lb.
4 cwts. superphosphate ... 2 ,, sulphate of ammonia 2 ,, muriate of potash ...	9	16	8	5	13	12	11	1	57
4 ,, superphosphate ... 2 ,, sulphate of ammonia 2 ,, sulphate of potash	9	3	59	4	15	28	10	13	30

The muriate being the cheaper manure, the advantage from its use was considerable. In 1905, kainit, $7\frac{1}{2}$ cwts. per acre, was tried against the two other potash manures, with the same quantities of superphosphate and sulphate of ammonia, and the total yield per acre was only 5 tons 2 cwts. 20 lb. In all three cases artificial manures alone were used.

A more complicated question is that of the most profitable quantities and proportions of the three constituents of a complete potato manure, with and without 10 tons of farm manure respectively. A great number of published experiments bear upon this subject, but so irregularly that no definite decisions are to be derived from them. In this case, again, variations of soil and differences in the condition of land in reference to fertility in addition, would render uniformity hopeless. Still, if carried out under a uniform plan, a large number of trials would be instructive, taking superphosphate, sulphate of ammonia and sulphate of potash as the complete mixture of artificial manures. After all however, the best guidance for a grower to obtain is to carry out the trial on his own land. My own experience points to 4 cwts. of superphosphate and 2 cwts. each of the other two manures as the most profitable dressing when no farmyard manure is used. In one field last season the omission or halving of any one of the manures greatly reduced the yield, and the addition of 50 per cent. of superphosphate also diminished it.

Lime.—Many growers will contend that lime should be added to make a complete potato manure, but no precise experiments on this point have come to my notice, with the exception of one in each of the fields referred to above, and this trial was unsatisfactory, because the lime was placed in contact with the other manures. In each field it appeared to reduce the yield; but this may have been in consequence of its action upon the sulphate of ammonia. In Scotland it has recently been common to apply about 6 cwts. of ground lime per acre just before the field is cultivated for planting, and when so used it is incorporated with the soil and slaked before it comes in contact with other manures. When so applied on my crops at large, as it has been in two or three years, it has appeared to do some good, judging from the appearance of the haulm when part of a field has not had any lime; but the difference in yield was not obvious on inspection,

and was not tested by weighing. Considering how strongly the use of lime for potatoes has been advocated in Scotland, it is curious that it has not been included in published experiments.

Green Manuring.—Another desirable experiment is the ploughing-in of a green crop, such as white mustard, before potatoes are grown, as a substitute for farmyard manure. In my own experience this has proved highly advantageous, and where the manure named is scarce, a trial of the plan may be recommended. A fair crop of mustard can be grown if sown at any time before the end of August, and in some seasons a fortnight later, before it is necessary to plough the land up for the winter. Thus it can be produced after a crop of peas or second-early potatoes has been cleared off the ground, or even after wheat harvested early.

What is needed to settle as far as possible the unsolved problems in potato growing is a set of co-operative experiments, uniform in plan, carried out in various parts of the country and for a series of years.

ROMNEY MARSH SHEEP.

M. J. R DUNSTAN.

This breed of sheep has for centuries been kept on the extensive sparsely populated tract of alluvial land on the southern coast of Kent known as the Romney Marsh. This land was recovered from the sea at a very early period and comprises an area of some 40,000 acres of pasture which is administered as regards the system of drainage and of sea defence by Commissioners, and in the case of Romney Marsh by "Lords of the Level"; these levels are Romney Marsh, Walland and Denge Marshes, and Guldeford and Broomhill Levels. There is also a considerable area of grass land extending inland between the low hills on the north and north-east.

The soil varies in character from a poor sand and barely covered shingle to a deep, rich alluvial loam. There is a considerable quantity of grand old pasture land never turned up by the plough and getting no manure save that from the sheep and cattle bred and grazed on it.

The district is bleak and exposed ; hedges are absent, the fields

being divided by dykes, which, in a severe winter, when lightly frozen and filled with snow, are a serious danger to the flocks ; few trees are found for shade or shelter and the gales from east and west sweep unchecked across the marsh.

From this brief description of the area it is obvious that the breed of stock which can withstand the rigour of the winter and early spring and the unshaded heat of the sun in summer must be a hardy one, and this is pre-eminently the character of the Romney Marsh breed.

The breed has been kept practically pure from time immemorial. When the influence of the improved Leicester was

TYPES OF ROMNEY MARSH SHEEP (WESTBROKE FLOCK).

being tried upon some of our English long-woolled breeds, it is probable that some Leicester blood was introduced, and although the old Romney Marsh breeders foretold a falling off in the hardy thrifty character of their breed through the admixture of the Leicester blood, such a result did not ensue.

The following description of the old Romney Marsh sheep early in last century (1806) given by Mr. Price, states :—" The pure Romney Marsh bred sheep are distinguished by thickness and length of head, a broad forehead with a tuft of wool upon it, a long and thick neck and carcase. They are flat sided, have a sharp chine, are tolerably wide on the loin, have the breast narrow

and not deep, and the forequarter not heavy nor full. The thigh full and broad, the belly large and tubby, the tail thick, long, and coarse, the legs thick, with large feet ; the muscle coarse and the bone large ; the wool long and not fine, and coarsest on the breast ; they have much internal fat and are great favourites with the butcher. The wethers seldom reach the market until they are three years old ; they weigh from 140 to 168 lb. and the ewes from 136 to 154 lb."

The influence of the Leicester was to produce a smaller ,better-set-up, more compact, deeper sheep than the above-described type, and these weighed more than the long-legged and long-bodied animals ; they were also ready for the butcher a year earlier ; they did not consume so much food, and so permitted of increased stocking of the land, whilst the wool was improved in quality without losing its heavy weight. The breed since this period has been maintained pure, and its present high position for utility, both as a meat and wool-producing animal, is due to the skill and enterprise of the breeders, who are reaping their reward in the rapidly advancing popularity of the breed in the esteem of flock masters all over the world.

The typical Romney Marsh sheep of to-day may be described as follows :—Face and legs white, large thick woolly ears, broad forehead and muzzle, black nose, tuft on forehead, thick scrag, long carcase with well sprung ribs, wide across hips, not "boat-ended," heavy forequarter with plenty of width across shoulder and between forelegs, good wide dock, wool fine and thick on pelt, free from kemp or hair, with a decided staple and even character all over the fleece.

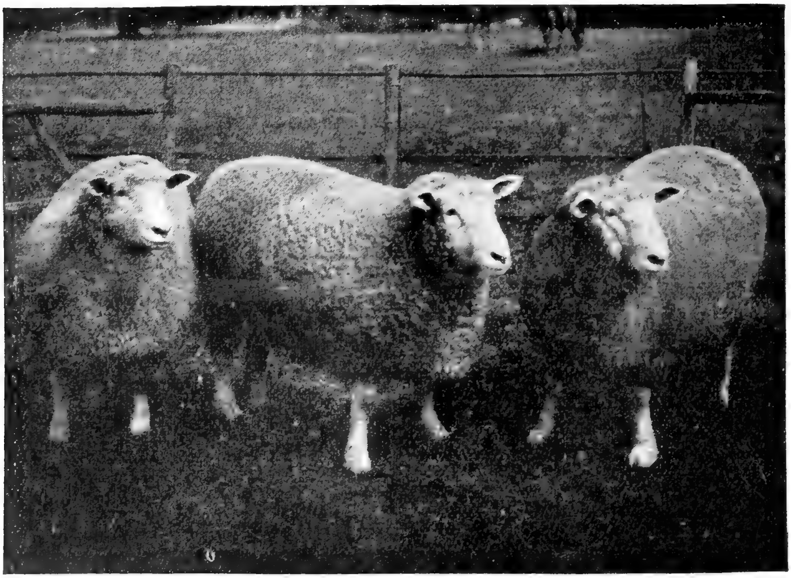
The main characteristics of the breed are :—

1. *Hardiness.* The climate of their native haunts requires a pronounced degree of hardiness. The Romney Marsh sheep subsists on the natural herbage all the year round, except when as lambs they pass their first winter inland.

Hay feeding is not common during the winter, and it is not a general custom to move the sheep from the pastures even during the severest weather. During early spring on cold days in the marsh, sheep other than Romneys will be seen "tucked up" and evidently suffering from the cold, whilst the sheep of the district seem unaffected by the weather. Lambing takes place in the open and little assistance is required ; even in severe weather the proportion of losses is small.

2. *Thriftiness.*—It is said that Romney Marsh sheep will thrive where others will starve. It is essentially a grass sheep, though a proportion of the lambs are wintered on a fold, and it is a good forager for its keep. A flock of Romneys will not graze all together as Downs will, but scatter themselves over the field.

3. *Fecundity.*—The breed is a prolific one. With good management one- or two-lamb ewes should produce half twins, and tegs 10 per cent. twins, or one-third twins from a mixed flock. The ewes are good mothers and produce plenty of milk. The record from one flock shows 320 two-lamb ewes yielding 539 lambs, 200 ewes with doubles, 19 with threes and 101 singles.



PRIZE SHEARLING ROMNEY MARSH EWES (MACKNADE FLOCK).

4. *Early Maturity.*—Romney Marsh lambs come as quickly to the butcher as any other breed ; being born in March to April, they make first class grass-fed fat lambs in July or August, and if weaned or folded, make excellent mutton by Christmas and later.

They are essentially a kindly breed, and, if well-bred, are first-rate doers. For large mutton the grain is not coarse, and the popularity of the meat is shown by the great demand for it in the Kent and Sussex markets. Compact, well-fed sheep will make nearly as high prices per stone as Downs.

5. *Wool.*—The wool is of heavy weight, long and full staple and demi-lustre. Great attention has been paid in recent years to the wool and a decided improvement has resulted, there being more first class and less breech and coarser wool in the fleece. The sheep are shorn in June, the general practice being to shear the lambs also. The practice of shearing the lambs is due to the general consensus of opinion that the heavy coat of wool hinders the rapid putting on of flesh, and unshorn lambs are therefore less "kindly"; the lambs are also not so liable to be "struck" by the fly and they are also freed from "ticks."

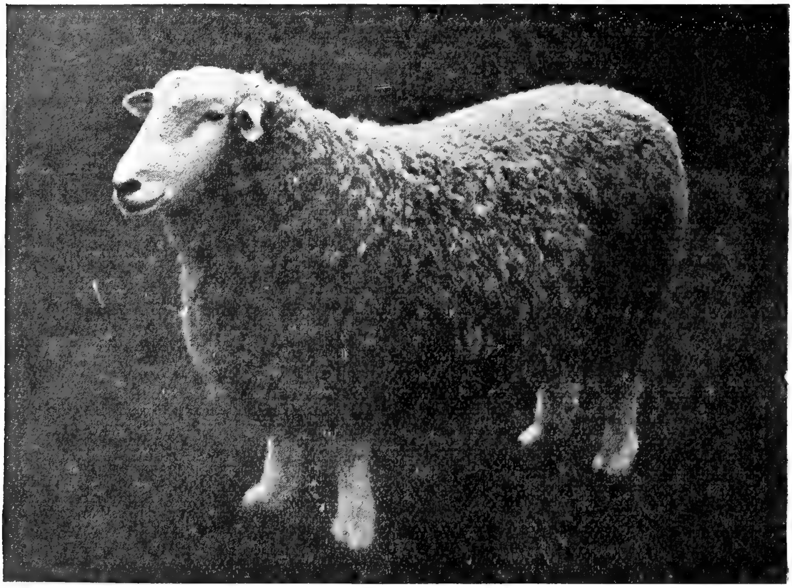
The wool as a rule sells at a trifle lower price than Down wool (though it has been known to sell at a higher price). The average clip from ewes, washed before clipping, is 8 to 10 lb.; tegs, 7 to 9 lb.; lambs, $1\frac{1}{2}$ lb. A ram lamb aged four months has been known to clip $7\frac{1}{2}$ lb., and rams up to over 20 lb., showing the possibilities of the breed.

For crossing purposes the Romney is an excellent subject, the South Down, Shropshire, Hampshire, and Suffolk rams being used, and the quality of the mutton is improved by the use of the Down breeds. For early maturity the Hampshire cross is by some considered the most serviceable; others, however, prefer the Shropshire cross as they fatten more quickly, whilst for quality the South Down cross makes a first class butchers' sheep. The Romneys, being good mothers, feed their lambs well, and a good many are crossed for fat lambs.

The system of management in the Marsh is to turn in the tups in November so as to lamb in April, as by that month the severest of the weather is over and the grass is sufficiently forward for a fair bite. Lambing, as has been already mentioned, takes place in the open; the lambs are weaned in July, and then or in the months of August and September they are sent to winter in the uplands of Kent or Surrey and Sussex, most of them being wintered entirely on grass and no artificial food given. This system is not a satisfactory one and has a detrimental effect on early maturity. The lambs are in good condition when they go up, but, being out to keep, they do not get the same consideration in many cases as if under their owner's eye, and they return in diminished numbers in the following spring in poor condition and their development checked, and such flesh is as every stock-owner knows, difficult and expensive to replace. The lambs

might be wintered in Romney Marsh if suitable shelter could be furnished upon land which has been mown or grazed with horned stock, but the hard stocking of the land with sheep in this district makes this as a rule impossible, and unless the Marsh flock-master has his own upland grazing land, he is at the mercy of whoever takes his lambs to keep.

The Marsh flock-masters have only one special disease to fear, "Struck," and this disease, which often occasions losses of as much as 10 per cent. among the flocks on the Romney Marsh, is probably akin to black-quarter in cattle, and is fatally contagious



ROMNEY MARSH RAM (MACKNADE ROYAL CARLISLE).

if the blood, etc., of the flayed sheep which has died of the disease is by any means introduced into the system of a healthy animal. The symptoms are generally not noticeable until the animal is in a dying condition, and, on removal of the skin, the black patches, symptomatic of the black-quarter disease, are found on the muscle. The losses occur most frequently among sheep in high condition after a flush of grass, and are more severe in some districts than in others. It is sometimes wrongly termed anthrax, with which it has no connection. Experiments are now in progress by Professor Cave, of the Wye College, to investigate the effect of a protective inoculation such as has been used in the United States

with good effect on the black-quarter disease of cattle, and, if a satisfactory vaccine can be found, it may probably be an economical safeguard against the serious losses caused by the disease.

The increasing popularity of the Romney Marsh sheep among foreign flock-masters is strikingly shown by the large increase both in the number and price of the sheep exported. Most of the sheepbreeding countries of the world are now asking for this breed for crossing with the Merino or native sheep, and its influence on the hardiness, wool, and meat of the cross is excellent. In South America in particular the demand is increasing, as it is found that the breed stands the climate better than the other long-wool breeds. The breed is also making rapid headway in Australia and New Zealand.

There is no doubt that the Romney Marsh sheep have great powers of adaptability and will live and thrive under almost any climatic conditions, and upon any variety of feed in sheep bearing countries. It may also be claimed for them that they are less susceptible than other breeds to such diseases as Fluke or Liver Rot and Foot Rot.

REARING AND MARKETING OF GEESE.

J. W. HURST.

Under suitable conditions, geese are as profitable as any other class of poultry—in comparatively small flocks. They are essentially suitable stock for farmers and commoners; being grazers they require a larger range than other poultry-keepers have available; but it is chiefly owing to their grazing habit that so many farmers will have nothing to do with them. The objections usually advanced are that four-legged stock will not graze after them, and that they are destructive to the herbage of the pasture; but, according to my experience, both arguments are fallacious.

For a succession of years I have kept a small flock of geese on the same fields in which horses, cattle and sheep have grazed, and have never found that the larger stock refuse or in any way object to feed after them. With regard to the supposed destruction of herbage, geese will search for and greedily devour the tuberous root of the ranunculus, thus con-

suming that which is undesirable for other stock—a habit that should commend them to dairy farmers, in whose pastures these acrid weeds are too often unduly abundant. I have, however, never found geese destructive to any but obnoxious plants.

It is not generally wise or desirable to run these birds in any but small flocks, except in very special circumstances of accommodation or profitable outlet, the ordinary demand being limited and variable. In many, perhaps most, localities a moderate supply will nearly always find a remunerative sale as goslings; or they may, without undue risk, be sent off the grass to London during the season. The distinctive goose market at Michaelmas has practically ceased to exist; there is still a demand at that time of year, but not one materially greater than that which now prevails during earlier months. Where stubbles are available some of the birds may be profitably run on them for the autumn markets, or fattened later for Christmas, when there is a more or less considerable demand for fat geese. Of course, at the latter season the goose only occupies a second place in relation to the turkey; moreover, the position of the English goose at Christmas is further assailed by the imported goose, many poulterers regularly stocking the foreign birds to the entire exclusion of English, on account of the more favourable wholesale price. Unless, therefore, the English producer can market birds of exceptional quality and size, he will find the average Christmas market too keenly competitive, and would do much better to dispose of his goslings off the grass in May and June. If sent to London salesmen the consignments should be timed to reach the markets on a Wednesday or Friday, which are the most suitable days for favourable sales.

Breeds.—For the English farmer or commoner the best breeds for purely table purposes are the Embden and the Toulouse, or a cross between the two. The Embden has white plumage, flesh-coloured bill, orange shanks, a square, deep-set body and a tall upstanding carriage; the average weight for an adult gander is 20 lb., and for a goose 18 lb., but much greater weights are attained. The Toulouse is of a dark grey colour on the upper part and a lighter shade on the breast, which gradually merges into the white of the under part; the bill is of a red flesh colour and the legs orange-red; the body is full and compact, with a

convex back, and the weight is generally greater than that of the Embden.

The Canada goose, which is extensively bred in America, thrives better than the Embden or Toulouse on marshy land; it is more delicate in flavour than the other breeds, and is consequently preferred by many on that account. Its colouring of brown-grey, white and black, being very effective, it is in demand—to a limited extent—for the stocking of ornamental waters.

The Nile goose, referred to by many classical writers, which figures on the fresco "Geese of Medum" (some 6,000 years old) in the Cairo Museum, is perhaps more ornamental than useful; but the Chinese goose, the breeding of which is a great industry among the floating population on the Canton River, is capable of attaining considerable size, is readily fattened, and has the reputation of being extremely prolific.

Breeding.—Geese will continue to produce eggs profitably until an advanced age (my own are nineteen years old and have averaged fifty-five eggs each per year during the last five years), and for sitting purposes the eggs of mature birds are much more reliable than those of young stock—the risk of infertility is reduced, and the vigour and hardiness of the goslings is increased—therefore rearing is easier and the profit more assured. The breeding pen should consist of a gander and two or three geese; the geese will commence to lay in February or not later than early March, producing (if not allowed to sit) an average of from fifty to sixty eggs in a season. An ordinary hen will cover four or five goose eggs, ten being a suitable number for a goose; the period of incubation is thirty days. The stock birds must be housed in a roomy shed, well littered, and having a wire-netted open front; when the laying season approaches a rough nest should be made in a convenient place, and provided with an ordinary nest egg. If this is not done the eggs may be dropped near the water. It is necessary that the geese should have access to water not only for swimming but also to ensure fertility in the eggs. The only supplied food necessary for the stock birds is a small allowance of soft food in the early morning, and a sprinkle of corn when they return from the fields at night; even this is not always required.

Rearing and Fattening.—When hatched the goslings should

be cooped out with the hens that have hatched them, in the same manner as chickens, and during the first week or two fed at the same intervals. For the first few days they may be fed on biscuit meal (or soaked bread), mixed with a good proportion of well-chopped dandelion leaves. This may be changed to Sussex ground oats and boiled rice at the third or fourth day; by the end of the first week they will have made considerable progress as grazers, and their rations will consequently not require increasing in the same proportion as those of other growing stock. By about the tenth day they will be able to do without any brooding, and the hens may be turned out and brought into condition for laying again. On a suitable grass range they will then make rapid progress with a comparatively small allowance of bought food.

If for early marketing their grass range should not be too extended, and they should not be allowed to enter swimming water; in addition to the grass, the supplied food should consist of two moderate meals daily of a soft food mixture, for which purpose barley meal, middlings, and a small proportion of brewer's grains may be used. Goslings thus treated should be in good killing condition well under three months. Those intended for the autumn market should be run free during the earlier months, or may, during part of the time, be folded on turnips, being more closely confined for the last month before killing and fed on meal and brewers' grains. When run on for winter fattening they should be allowed the same liberty and treated in the same manner as the old birds from the time they are feathered, being confined to a roomy open-fronted shed a month or five weeks before killing, and allowed two full meals daily of soft food in the morning and corn in the afternoon—the grain being fed in the water troughs with a good supply of grit. It is also necessary to keep the fattening birds well supplied with green food during the period of their confinement.

Killing and Preparing.—The birds must be sufficiently fasted before killing. I have always found killing by dislocation of the neck to be the best method, and it has the great advantage of being cleanly, but in the case of large birds, or where there is a doubt as to the strength of wrist, it should not be attempted. The alternative method is to pinion or lock the wings over the

back to prevent unnecessary struggling, to tie the legs and hang the bird up by them, then to stun the bird by a sharp blow on the back of the head, and immediately sever the jugular vein by means of a sharp penknife thrust through the neck behind the lower jaw. The usual preparation for shop or market consists of rough plucking and pressing until cold.*

Manuring of Potatoes.

Potatoes, being worth so much more than an equal weight of roots, should be more liberally treated as regards manure. Under ordinary circumstances farmyard manure (15 to 20 tons per acre) should be the basis, supplemented by an artificial manure.

If there is abundance of organic matter in the soil, as, for instance, when potatoes are taken after a two or three years lea, artificials alone will, in many cases, grow a full crop of potatoes.

In view of the valuable nature of the crop, and especially in the case of early potatoes, farmers can not only afford to manure liberally, but it will also pay to compound more complex mixtures than in the case of less valuable crops. The following mixture, which is recommended in Leaflet No. 80, will be found generally serviceable :—

½ cwt. nitrate of soda.
½ cwt. sulphate of ammonia.
2 cwt. dissolved bones.
2 cwt. superphosphate.
1 cwt. sulphate or muriate of potash (about 70 per cent. purity).

In some recent experiments carried out by the Edinburgh and East of Scotland College of Agriculture (Bulletin XII), this mixture was tried in comparison with nine other combinations of artificial manures, and gave the best results of all the mixtures tried. The substitution of nitrate of potash for nitrate of soda resulted in a slightly decreased yield.

* A leaflet (No. 183), on the marketing of poultry is in course of preparation.

The Board's leaflet goes on to state that it would be an improvement, though involving a little more trouble and expense, to use only $\frac{1}{4}$ cwt. of nitrate of soda and $\frac{1}{4}$ cwt. sulphate of ammonia, and to add $\frac{1}{2}$ cwt. of fish guano, and $\frac{1}{2}$ cwt. of Peruvian guano. Five to 6 cwt. per acre of such a mixture may be used with a moderate dose of dung.

When potatoes are grown after a two or three years' lea without farmyard manure, a mixture of $\frac{1}{2}$ cwt. nitrate of soda, 1 cwt. sulphate of ammonia, 2 cwts. dissolved bones, 3 cwts. superphosphate, and 2 cwts. sulphate of potash per acre may be employed.

The slowness of action of basic slag renders this manure unsuitable for use on potatoes. This is borne out by the experiments above referred to, where the substitution of basic slag for superphosphate gave a smaller yield by 17 cwt.

The Solanum Commersoni and the "Blue Giant" Potato.

Reference was made in an earlier number of this *Journal** to the introduction into France of the *Solanum Commersoni*, a tuber of the potato family, from which a variety distinguished as "Violet" was obtained. This variety proved to have an excellent flavour, similar to the ordinary potato, and its cultivation promised to be of importance. Further investigation, however, has given rise to doubts as to how far it can be distinguished from the variety known as Blue Giant. In an article in the *Journal d'Agriculture Pratique*, January 24th, 1907, M. Philippe de Vilmorin reviews the opinions expressed by various experimenters, and points out that, owing to the well-known influence which a change of soil or climate has upon the potato, it is necessary, for the purpose of exact comparison, that tubers should be grown under exactly similar conditions for two or three seasons, as any newly imported tuber is likely, in the first season, to be more vigorous and leafy, and to give a better yield than a tuber of the same variety grown for some seasons in the same soil. Trials conducted by M. de Vilmorin on these lines

* Oct. 1904, p. 412.

have led him to believe that the " Violet " *Solanum Commersoni*, and the " Blue Giant " are identical, and this view is supported by a number of other experimenters. M. Labergerie, the originator of the " Violet " variety, however, disputes the accuracy of these conclusions, and considers that the resistance to disease, the superior yield, the flavour, and the preference for moist soils exhibited by his variety, afford sufficient evidence to enable it to be distinguished from the Blue Giant.

The two tubers have been grown side by side in this country, and no difference in their tubers or in the whole plant could be detected. The " Violet " variety, however, may well have been a " sport " from *S. Commersoni*, as it is no further removed from that plant than " Blue Giant " is from *S. tuberosum*. Moreover, competent observers find good reasons for believing that *S. Commersoni* and *S. tuberosum*, as known to botanists, may be only feral forms of one species.

Feeding Dairy Cows. Effect of Brewers' Grains.

Experiments on the feeding of dairy cows have been carried out by the Armstrong College since 1903, and a report (Offerton Bulletin, No. 2) recently published gives the results obtained in 1905–6. Generally they confirm the experiments carried out here and elsewhere in showing that there is no advantage in giving cows more than enough food to keep them in a thriving condition.

It was found that in the case of cows at grass the effect of a supplementary ration of 4 lb. to 8 lb. of concentrated food, consisting of Bombay cake and maize meal, on the yield of milk was exceedingly small, and was observable only towards the end of the season, when the pasture was becoming stale and the nights cold ; the cost was naturally out of all proportion to the slight effect produced. In the same way no advantage was obtained as regards the quality of the milk. Quality is mainly dependent upon the character of the cows, and provided the animals receive adequate nourishment, no increase in the ration is likely to affect the quality to any appreciable extent.

Two experiments were also undertaken to ascertain the effect of brewers' grains upon the quantity and quality of

milk, and it was found that a moderate allowance of say 20 lb. of brewers' grains per day had the effect of materially increasing the daily yield of milk. The experiments did not continue long enough to show the exact duration of this effect, but it would appear to be more or less permanent, and would in practice cause cows to yield considerably more than their normal quantity of milk during the lactation period, which might also be materially lengthened by the judicious use of brewers' grains.

The effect of brewers' grains on the yield is relatively greater early in the lactation period than it is later on, but they cause a material increase in the yield when used comparatively late in the lactation period. As regards their effect on the percentage of butter-fat, there are indications that early in the lactation period, they tend slightly to reduce it, but towards the end of the lactation period they do not seem to have any appreciable effect. But in the case of cows whose mixed morning milk is habitually low in butter-fat, brewers' grains are probably not a food to be recommended, especially during the earlier portion of the period. Their effect on the non-fatty solids is apparently inappreciable.

Having regard to milk only, the best time to use brewers' grains is when the cows are well advanced in the lactation period, when the milk-yield is falling off and when, as a rule, the butter-fat is higher. They may be a very useful food under these conditions, but milk-sellers should use them sparingly even then if their milk is regularly low in butter-fat.

Milk Tests and Records.

The only certain means by which the milk yield of individual cows in a dairy herd can be known is by weighing the milk produced during the whole lactation period. The value of the information to a milk seller can hardly be over-estimated. It enables him to improve his herd by weeding out unprofitable animals, and prevents the loss due to maintaining cows not worth their keep; and where the herd is kept up by breeding, the heavy milkers can be selected to breed from. A systematic milk record also tends

to enhance the value of stock sold, and affords some indication of the health of the animals.

The enormous difference in the quantity of milk yielded by different cows is well known. An example may be quoted from some experiments carried out by Mr. Alex. Lauder for the East of Scotland Agricultural College, where the milk yield of a herd of cows was under investigation. Here it was found that the yield of the best cow in a year was 1,505 gallons and of the worst 478 gallons, and taking the value of the milk at 6¼*d.* a gallon, the five best cows produced milk worth £149 5*s.* or £29 17*s.* each, while the five which stood lowest on the list produced only £85 8*s.* or £17 1*s.* each. Variations of this sort are not uncommon, and although in a general way farmers are able to distinguish between the good and bad milkers in their herds, a difference of 100 or even 200 gallons is not so easily appreciated without accurate records. A difference of 100 gallons at 6¼*d.* is, however, worth 52*s.*, and it is not too much to say that cows in the same herd frequently differ in their production by as much as £5 without the owner being aware of it.

Records of milk yields are not difficult to keep and take a very small amount of time and trouble. All that is necessary is a spring balance to which a pail can be hung. This can be obtained with a dial-plate marked in gallons and pounds with an allowance for the weight of the pail. The pail containing the milk obtained from each cow should be weighed and the weight in pounds noted on a sheet which should be fastened up in the cowhouse near the spring balance. It should be ruled so as to take the record of each cow in the herd for a week or a month, as may be desired. This work should be made part of the daily routine and will be found to occupy very little time. An accurate result is thus obtained, and there is less likelihood of its being overlooked.

The total yield can, however, be estimated with approximate accuracy by weighing the milk for one day in each week or each fortnight and multiplying the figure obtained by seven or fourteen. If this is done systematically a record will be obtained which is sufficiently close for the purpose of comparing one cow with another or for deciding whether a cow is paying her way. According to some experiments made in

the United States (Bureau of Animal Industry, Circular 103), it is probable that the results will not be incorrect by more than 2 or 3 per cent.

Testing the Milk for Butter-fat.—The Board have on several occasions directed attention to the importance of testing milk. It is pointed out in Leaflet No. 146 that in the vast majority of cases the milk given by the cows of this country exceeds in butter-fat and other milk solids the percentage specified in the "Sale of Milk Regulations, 1901," made by the Board of Agriculture. It happens, however, occasionally, that for one reason or another a cow may give milk which does not contain those percentages (3 per cent. of butter-fat and 8·5 per cent. of other milk solids); and in such cases the dairyman, when prosecuted, is required to prove that the milk is genuine. In order to avoid the trouble and annoyance of a prosecution, farmers, dairymen, and all other cowkeepers are strongly recommended to have samples of the milk of their cows tested from time to time. By this means they will be able to watch the seasonal and other variations in the fat contents of the milk, and by modifications in the management of their cows, and, if necessary, by disposing of animals that give milk of low quality, to keep the quality of their milk at a satisfactory level.

Where milk is used for butter-making it is essential that the dairyman should see that all his cows are yielding milk with a high percentage of butter-fat, otherwise unless a very high price is obtained for the butter the value obtained for the milk is very low. For instance, 3·6 per cent of fat in the milk is equal to a butter ratio of 1 : 25, that is every 25 lb. of milk will produce one of butter, so that if the butter only fetches 1*s.* a pound it represents less than 5*d.* a gallon for the milk. It is, therefore, of the highest importance to every butter-maker to see that each cow in the herd is producing milk of high quality.

Arrangements have been made with most of the Agricultural Colleges and Agricultural Departments of the Universities for determining the percentage of butter-fat for a fee of 6*d.* per sample. A list of these institutions and directions for sampling are given in Leaflet No. 146. An important point in this connection is the frequency with which these tests

are required in order to give an accurate indication of the average richness of the milk. Cows vary so much in the amount and quality of their milk from one milking to another that exact results cannot be obtained by testing the milk from one milking at distant intervals, while at the same time it is obvious the testing of the milk of every cow in a herd is too laborious or expensive a process to be undertaken at very close intervals by the ordinary dairy farmer.

In Denmark the testing of milk is done co-operatively by a number of farmers combining to employ a man who goes from farm to farm and weighs, tests, and records the milk produced at each in twenty-four hours, and in these cases the milk is usually tested fortnightly.* The Wisconsin Experiment Station, which has devoted much attention to this subject, recommends sampling once a week. The Illinois Experiment Station recommends sampling each cow's milk for fourteen consecutive milkings every seventh week, and it has been proved that so far as average results are concerned, figures deduced from tests on this basis are substantially correct.

The number of tests required during a lactation period is illustrated further by an experiment made at the Illinois Station, in which the milk of each of six cows was weighed and analysed daily during the whole period of lactation. These daily records enabled the actual results to be compared with the results which would be obtained from estimates calculated from the tests at intervals of 7, 10, 15 or 30 days. Testing the milk every seventh day gave 98 per cent. of the actual total butter-fat; testing every two weeks gave 98·5 per cent., and testing every month gave 97 per cent. or an error of 3 per cent.

The Vermont Experiment Station also has given some attention to the question when a cow should be tested in order to give a correct idea of the year's production if only one or two tests are made during the lactation period. This station recommends, when only two tests of each cow's milk are to be made during the same lactation period, that samples should be taken as follows:—

* Milk Testing and Control in Denmark.—*Journal*, April, 1905, vol. xii, p. 21.

	First Sample. Weeks after Calving.	Second Sample. Months after Calving.
For spring cows	6 ...	6½ to 7½
For summer cows	8 ...	6 7
For autumn cows	8 to 10 ...	5½ 7

In case only one test is to be made, approximately correct results may be obtained by testing the milk in the sixth month from calving in the case of spring cows, in the third to the fifth month in the case of cows which calve in the summer or autumn. In all cases composite samples of the milk are to be taken for four days in the middle of the month.

The Maryland Station, after a very exhaustive examination of this question, decided that the seventh month of the lactation period would be the best to test a cow when only one test is to be made. When two tests are to be made at different periods, this station found that the third and eighth months would be best, and when three tests are to be made, the third, sixth and eighth months.

Owing to variations in the composition of the milk, more especially in the morning and evening milk, it is necessary to take several samples which should be thoroughly mixed so as to obtain for analysis a fairly representative sample.

In taking a sample for analysis it should be borne in mind that there is frequently great variation in the composition of the morning and evening milk from the same cow. If it is desired therefore to ascertain the average amount of butter-fat in the milk, a representative sample should be made up by mixing in equal quantities, samples carefully taken from both the morning and evening milk.

Australian Dairy Legislation.

The regulations which are now in force in Australia under the Commerce Act of 1905, prohibit the export of many articles of agricultural produce unless a "trade description" is applied to the goods by means of a label or brand indicating their true description, the word "Australia," the name of the State of origin, and of the manufacturer or exporter, or his registered brand, and the net weight, except in the case of carcases of meat.

In the case of butter, the trade description must specify (1) whether it is pure creamery butter, pastry butter, or milled butter ;* (2) the name and percentage of any contained preservative, as well as the proportion of casein, water, and colouring matter ; (3) that it has been repacked, if the exporter (who is not the manufacturer or producer) repacks it under a brand other than that of the producer or manufacturer. In the case of cheese, the trade description must indicate the quantity of rennet, the quantity and nature of the colouring matter (if any), and the percentage of any preservative or foreign matter contained in the cheese.

The export of goods which do not comply with the following standards at the time of shipment is prohibited, unless the label contains the words "below standard," or indicates how the produce falls short of the standard :—

"Butter" is defined as containing (*a*) no fat other than butter fat ; (*b*) not more than 16 per cent. of water, 3 per cent. of casein, 0·5 per cent. of boric acid, 4 per cent. of salt ; (*c*) not less than 82 per cent. of butter fat : (*d*) such colouring matter as is deemed harmless by the authorities.

"Cheese" does not contain any foreign matter other than rennet, salt, or colouring matter deemed harmless by the authorities.

"Concentrated milk" : pasteurised milk which is concentrated by any process whatever, and not subsequently sterilised, and which contains not less than 9 per cent. of butter fat and 24 per cent. of milk solids not fat, and no foreign substance other than 0·5 per cent. of boric acid.

"Condensed milk": milk which is condensed or concentrated by any process whatever, with or without the addition of cane sugar, and which, when containing such sugar, also contains not less than 9 per cent. of butter fat, and 24 per cent. of milk solids not fat, and when not containing such sugar, contains not less than 8·5 per cent. of butter fat and 22·5 per cent. of milk solids not fat.

"Dried milk": milk from which the water has been removed

* Creamery butter is defined as butter made from centrifugally-separated cream ; "pastry butter," as butter which is unfit for ordinary table use ; and "milled butter" as butter which is a mixture or blend of two or more butters ordinarily packed alone and under separate names or brands, and which have been mixed or blended at a place other than where manufactured and packed under other than the original names or brands.

by a process of heating, without the addition of any extraneous matter, and which, when dissolved in or treated with water, according to any directions supplied by the maker or vendor thereof, produces milk as here defined.

"Milk": the milk of cows, whether mixed or not, containing not less than 3 per cent. of butter fat, or less than 8·5 per cent. of solids not butter fat.

"Honey": the ripened, unfermented honey of bees, which does not contain any foreign matter.

"Meat extract" or "meat essence": the extract or essence of meat which has been obtained by cooking the flesh of cattle or sheep, but not the internal organs thereof, and which contains no extraneous matter other than common salt.

Goods are inspected and approved before export unless the authorities are satisfied that the relative legislation of the State in which the produce was made is as effective as the Federal law. Exporters may request to have their goods classified, certified, and marked. The design of the official stamp consists of a six-pointed star bearing the words: "Commonwealth of Australia" and "Approved for export." Butter is marked as follows:—(*a*) first class, superfine: pure creamery butter, containing not more than 14 per cent. of water, and classified at 94 points or over; (*b*) first class: pure creamery butter, classified at 86 to 93 points; (*c*) second class: pure butter, classified at 75 to 85 points; (*d*) third class: pure butter, classified at less than 75 points. Cheese is marked similarly: (*a*) first class, superfine: pure cheese, classified at 94 points or over; (*b*) first class: pure cheese, classified at 86 to 93 points; (*c*) second class: pure cheese, classified at 75 to 85 points; (*d*) third class: pure cheese, classified at less than 75 points. "Impure butter or cheese" is not marked. The flavour and aroma, texture, and condition of the butter are taken into consideration, and the maximum points awarded are as follows:—Flavour and aroma, 50 points; texture, including body, grain, and moisture, 30 points; condition, including colour, salting, packing and covering, 20 points.

Export certificates, for goods which are classified, are numbered and coloured differently, according to the classification, and they are issued in triplicate; one copy for the exporter, one for the manufacturer and one for official use. The number

of the certificate is marked on the goods, in addition to the stamp.

Regulations under the Pure Food Act, 1905, have also been made in the State of Victoria, and official standards have been fixed for a large number of commodities.

Butter must not contain less than 80 per cent. of milk fat or more than 15 per cent. of water. Boron compounds (estimated as boric acid) or saltpetre, up to ·25 per cent., by weight, and harmless vegetable colouring matter, may be added ; but the use of sesame oil (as a solvent in the preparation of colouring substance added to butter and cheese) and the addition of any other foreign matter is prohibited. Renovated butter is defined as the product obtained by melting, re-churning, and re-working butter without the use, or addition, of any substance other than milk, cream, water, and salt. It must contain not less than 80 per cent. of butter fat and not more than 15 per cent. of water. The addition to renovated butter of any foreign fat is prohibited. Margarine must contain not less than 5 per cent. of sesame oil. Cheese must contain in the water-free substance the following minimum proportion of fats wholly derived from milk : cream cheese, 60 per cent. ; whole-milk cheese, 50 per cent. ; skim milk cheese, 10 per cent. The addition of preservatives, except common salt, or of colouring matter, unless it is harmless, is prohibited. The standard for cream is not less than 40 per cent. of fatty solids ; for milk, not less than 12 per cent. of total solids, 8·5 per cent. of solids not fat, 3·3 per cent. of fatty solids, and not more than 1 per cent. of ash ; and for separated or skim-milk, not less than 8·5 per cent. of milk solids and not more than 1 per cent. of ash.

Persons who desire further information may consult these laws and regulations at the Offices of the Board of Agriculture and Fisheries, 4, Whitehall Place, London, S.W.

The Preparation of Wool for Market.

In their leaflet, No. 82 (*The Preparation of Wool for Market*) the Board have drawn the attention of farmers and others to the great importance of carefully preparing wool before it is marketed. Some extracts from a paper on the subject, read by Mr. S. B. Hollings, at the Sixth International Conference of Sheep Breeders, held at Derby on June 26, 1906, were given in this *Journal* in August last. The need for greater care in preparing wool for market was emphasised at a meeting of the Home Wool Buyers' Association, held at Bradford on 4th April last. This Association consists of manufacturers, spinners, and wool merchants, and among its objects are: to draw the attention of the wool growers of the United Kingdom to the more careful preparation of wools for the Bradford market; to ensure that all wools submitted to public auction shall be guaranteed free from dockings, locks, fallen wool, &c., and to pay attention to the "condition" of skin wools.

The chairman, Mr. F. Willey, J.P., said that the Association had been formed with a view to bringing the producer, the dealer and the consumer of wool into a closer relationship. They in the trade were much indebted to those who fostered and encouraged the breeding of sheep. It was undoubtedly in the interests of the grower that he should keep a breed of sheep which would grow the best wool obtainable, and when grown it was to his interest to have it got up for the market in the best possible shape. By this he meant that it should be washed in the best style practicable, that it should be properly cleaned, have all the dockings clipped off the fleeces, and be kept as free from straws and sticks as possible. It should then be carefully wound into presentable fleeces. Many farmers, in getting up their wool, seemed to be under the impression that they could get as much for it if it was prepared for the market in a slovenly manner as they could by getting it up in a workmanlike and careful style. This was a mistake, as farmers' wool would always command a price commensurate with its condition and cleanness.

Many classes of English, Irish, and Scotch wools were often greatly in demand for American customers, and as there was in the United States a duty of 6*d*. per lb. on all wools grown in this

country, it was of the greatest importance that they should import only the cleanest and best yielding wools. There were many classes of our home grown wools which Americans could not buy because of the slovenly way in which it was sent to the market. Irish wool was the best, except for the tar marks; then came Scotch, though in many counties it was badly got up, whereas, if it were sent to market in proper condition, it would find a ready sale for export to America at considerably enhanced prices. Even those counties which had hitherto exported to the United States, would obtain higher prices if they exercised more care in the preparation of the wool. A great deal of the wool grown on the Yorkshire wolds was often badly washed and very slovenly wound, and if the growers consulted their own interests they would have it better done. Lincolnshire wool also left much to be desired, as did also that from many other counties in England.

Another point to which Mr. Willey directed attention was the harmful effects on wool of marking sheep with tar, &c. Flockmasters, he said, had a pernicious habit of marking their sheep with tar and paint late in the season. If branded in the early stages of the growth of the fleece, by the time the fleece came to maturity the marking material employed would have practically worn off and no very prejudicial effects would follow. It was computed that the loss incurred in Bradford and district alone owing to this practice meant about £7,500, but to the whole trade (at the moderate estimate of 1 oz. per fleece on the 30,000,000 fleeces grown in the United Kingdom) the loss amounted to no less a sum than £70,000 to £80,000 per annum. This entered into the calculations of the buyer at the time of purchase, and the purchase price would be increased in proportion to the cleanliness of the wool. If marking took place late in the season, then, when the wool came to be sorted, the tar and paint marks had all to be clipped off, resulting in serious loss to the grower. Mr. Willey further remarked that in the Colonies growers were far ahead of us in the way in which they get up the wool and sent it to market. Every care was taken in removing from the fleeces the short, inferior, and dirty wool which is grown on the bellies and skirts of the fleeces. These were packed and sold separately. The fleeces were then graded according to their

various qualities, with the result that much better prices were obtained than would otherwise be possible. It would be a great assistance to the trade if all wools submitted to public auction could be guaranteed free from dockings, locks, and fallen wool, a practice already in vogue at many of the south-country auctions. This would give buyers greater confidence in their purchases, with the result that better prices would be obtained.

It would be well if farmers would bear in mind these statements and pay greater attention to the conditions under which wool is produced, and to the cleanliness and packing of the fleeces. The Board's leaflet, No. 82 (*Preparation of Wool for Market*) will be sent free of all charge on application to the Secretary, Board of Agriculture and Fisheries, 4, Whitehall Place, S.W.

Wood Wasps.

The family *Siricidæ* (*Uroceridæ*), the Wood Wasps or Horntails, is one near in relationship to the Saw-flies. The wood wasps differ from the saw-flies (1) in having a single spine or spur to the tibiæ of the fore-legs; (2) the ovipositor of the female is different in shape, being modified for boring instead of sawing; (3) the adults are insects of larger size; (4) the larvæ have no legs other than the three thoracic ones; and (5) the larvæ are found tunnelling in the solid wood of trees.

The adult *Siricidæ* are insects large in size and often with marked colouration. They have cylindrical bodies, and round heads provided with well-marked biting jaws. The two sexes vary in colour and size, the males being generally smaller and more slender; even in the same species and sex there may be considerable variation in the size and colour of individuals.

The females are easily recognised by the boring ovipositor projecting from the hind end of the body. This ovipositor is made up of a two-parted sheath enclosing three pieces, an upper portion and two lower parts serrated near the tips; further, from the tip of the abdomen above the ovipositor there projects a short spine. The females, in spite of their formidable appearance, are quite unable to sting.

Wood wasps can make a loud buzzing sound. I have found the males of *Sirex juvencus* when kept together very pugnacious,

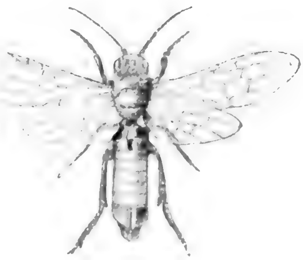
seizing one another and rolling over and over. The size of the insects and their humming sound are probably the foundation for the old myth of their having invaded towns and attacked the inhabitants.

The larvæ live in wood. They are whitish grubs with rounded bodies, and have small horny heads with mandibles fitted for gnawing. There are three pairs of stunted thoracic feet, and the last segment ends in a horny spine of use to the larva in its progression in the wood.

Two genera are of interest in forestry; the genus *Sirex* and the genus *Xiphydria*, which may be distinguished thus:—

Sirex.—The head is joined in ordinary fashion to the pronotum. *Xiphydria.*—The head is seated on a long neck-like continuation of the pronotum.

THE STEEL BLUE WOOD WASP, *Sirex iuvencus*, FEMALE.—(AFTER CAMERON).



THE GIANT WOOD WASP, *Sirex gigas*, MALE.—(AFTER CAMERON).

The larvæ of the genus *Sirex* live in the wood of coniferous trees and have a far greater forest importance than those of *Xiphydria*, which have been found in the wood of some broad-leaved species.

THE GENUS SIREX.

Of this genus there are two species in Britain, *Sirex gigas*, the Giant Wood wasp, and *Sirex juvencus*, the Steel-blue Wood wasp. Neither is so rare as is generally stated.

Sirex gigas.—The female may reach—including the ovipositor—a length of 1¾ in., but it may be as little as an inch or even less. This difference in size is characteristic of wood-infesting

insects. The head and body are black except the first two and the last three segments of the abdomen, which are yellow. The head behind each eye is yellowish. The shanks and the feet are yellow. The abdomen ends in a spine below which is the conspicuous ovipositor. The four membranous wings are brownish-yellow. The male is smaller, reaching 1¼ in. in length, though it may measure less than an inch. It is distinguished further from the female by its abdomen being red or reddish-yellow, except the first and the last segments, which are black or dark brown. *Sirex gigas* lays its eggs typically on spruce, but also on silver fir and more rarely on pine and larch.

Sirex juvencus.—The female may measure—including the ovipositor—up to 1½ in., but may be less than an inch. It is steel-blue in colour with reddish or reddish-yellow legs. The wings are clouded with yellow. The male may measure up to 1¼ in. Measurements of specimens taken by me in the same year are ¾ in., ⅞ in., 1 in., 1⅛ in. Rings 4 to 7 of the abdomen are red or reddish-yellow. In *Sirex juvencus* the head behind the eyes has not the yellow spots characteristic of *Sirex gigas*. *Sirex juvencus* lays its eggs typically on pine, but also sometimes on spruce; occasionally eggs are laid on silver fir.

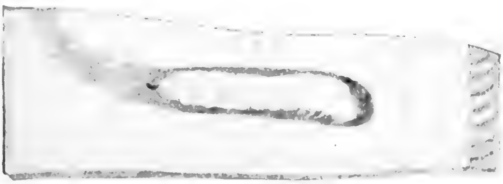
Sirex grubs are round and whitish. The head, provided with horny jaws, is followed by twelve segments. The three segments behind the head each bear a pair of weak legs; there are slight fleshy prominences on the other segments, but no legs; the hind segment ends in a horny spine. On each side of the grub are ten stigmata.

Life-history.—The female, by means of the ovipositor, bores through the bark of the tree right into the outermost youngest wood ring, and in each boring lays an egg. The larva on hatching may gnaw in the same wood-layer for a time, but later eats its way towards the centre of the stem. It afterwards curves round and gnaws its way towards the periphery, so that the completed tunnel or boring is more or less circular or sickle-shaped. This tunnelling outwards again to the outside of the wood has the advantage of leaving the adult insect, after pupation, with not too great a thickness of wood to eat through on its way to the open air. The tunnels are round in section and show plentiful frass and bore-meal. The full-fed grub pupates towards the end of its tunnel, and the adult insect, when

ready, continues the tunnel and gnaws with its mandibles a circular exit hole. In observing the exit I have been struck by the mobility of the head and the skill in making the hole.

Speaking generally, issue of adults takes place from the summer onwards. I have from different material in different years bred out the adults in late July, August, and September. Wood split in November has revealed live wood wasps which might possibly have issued in the next spring.

Wood wasps most assuredly often issue from timber imported into our country, but both species breed freely in our own timber. I have had the giant wood wasp from Devon, Norfolk, Arran, Perthshire, Midlothian, East Lothian, and a further record from Durham. The late Miss Ormerod had it sent to her from several Irish counties, and Mr. Theobald has recorded it from North Wales. Specimens of the steel-blue wood wasp have



LARVA OF *Sirex gigas*, IN TUNNEL GNAWED IN WOOD.

been sent to me from Aberdeen, Perthshire, Midlothian, Ayrshire, Peebles, Glamorgan, Suffolk, Kent, and Galway.

The time taken for the life-cycle from egg-laying to issue of adults will vary with the conditions—temperature, character of material, &c.—but in all probability the generation never takes less than two years, and it is often longer. Adult wood wasps have issued from worked timber in houses and factories, wood-work and plaster and lead pipes all having been bitten through. The appearance of the buzzing adults in inhabited rooms—the insects having completed their development in wood-work in the room—has more than once been the cause of alarm. I received a number of steel-blue wood wasps which had thus issued from the flooring of a smithy in Lockerbie. The flooring had been laid in November, 1898, cut from timber that had been lying in the open for a long time. The wood wasps issued in July, 1899, and more in September, 1900.

Wood wasps prefer old stems for their egg-laying. Pole

forest and suppressed trees are selected by the steel-blue wood wasp, and also trees 70 years old and upwards. The giant wood wasp larvæ have been found in stems from 40 to 50 up to 120 years of age. In cases where the insects are abundant the branches as well as the main stem are used for egg-laying.

Preference in egg-laying is for sickly suppressed trees and for those in any way wounded or injured, trees that have been barked in places, and trees already weakened by the attack of other insects. Perfectly sound stems that have been felled and are left lying are willingly made use of as brood places. Wood wasps do not lay in rotten wood. While *Sirex* attack may hasten the death of a tree already suffering from the invasion of other insects, the chief harm done is by rendering the wood useless for technical purposes. From a piece of old Scots pine stem 10 ft. long, I bred out over forty *Sirex juvencus;* from an Austrian pine cut into logs more than 100 larvæ and adults of *Sirex juvencus* were taken. Where infestation is so bad, it is easy to understand that the wood left may be fit only for the fire.

Preventive Measures.—1. The removal of any suppressed and sickly standing trees which if allowed to remain would provide suitable places for egg-laying and development.

2. The timely removal of broken, blown or felled timber, which would also be favourite places for egg-laying.

3. The burning of badly infested stems as a preventive against later and worse damage.

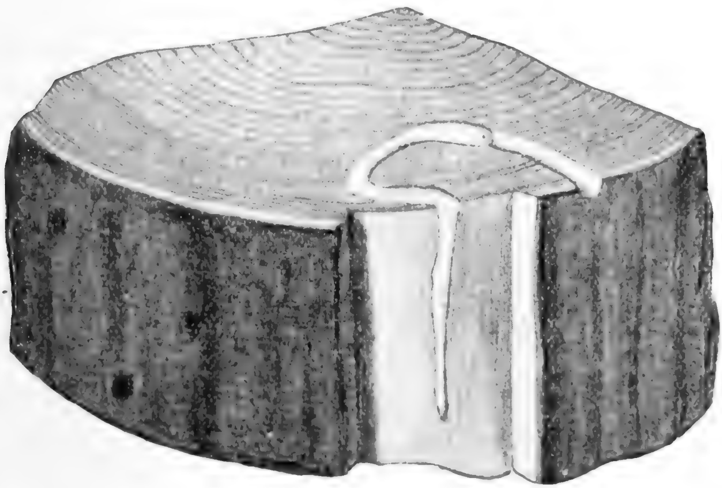
4. If it were known that cut or prepared timber was infested and that no great development of the larvæ had taken place, the owner might consider whether it was worth his while to prevent further destruction by impregnation.

5. The larvæ of an ichneumon (*Rhyssa persuasoria*) devour the wood wasps' grubs. The *Rhyssa* is a large and handsome insect with an ovipositor of great length and serrated at the tip. By means of the long ovipositor, *Rhyssa* bores into the infested stem and lays an egg in the gallery of the *Sirex* larva. The *Rhyssa* maggot on hatching feeds on the wood wasp grub. I have had *Rhyssa persuasoria* sent to me for determination from Glamorgan, Aberdeen, and Arran.

THE GENUS XIPHYDRIA.

The two species of *Xiphydria* have not till now proved themselves of much importance in forestry. *Xiphydria dromedarius* has had its larvæ recorded in Britain from willow, and on the Continent from willow, poplar, and birch. There is a further record of importance of the destructive work of the *dromedarius* larvæ on mountain or Wych elm in the neighbourhood of Munich.

Description of the Insect.—The head and thorax are black with white spots and markings; the coxæ are black and the legs reddish-yellow, with the points of the feet dark brown.



TUNNEL IN *Ulmus montana*, THE WORK OF THE LARVA OF *Xiphydria dromedarius*. SEVERAL FLIGHT-HOLES ARE ALSO SEEN IN THE BARK.—(AFTER LEISEWITH).

In the female the first two rings of the abdomen are black, the third is red, the fourth and fifth are red with a white spot at each side, the sixth is red with variable marking, the seventh varies in colour and marking, the eighth also varies in colour but has on each side a broad white stripe, and the ninth is black. In the male the two last rings of the abdomen are black, rings 3, 4, 5 and 6 are red, while 7 varies between red and black. Rings 3 to 8 have on each side a white spot.

The female measures in length, including the ovipositor, from 12 to 16 mm., and in wing-span 16 to 20 mm. The male

measures in length from 10 to 13 mm., and in span of wings from 14 to 15 mm. The larvæ are white with small rounded horny heads; the legs are weak. The larvæ have a great resemblance to those of *Sirex*, but there are only nine stigmata on each side; there are differences, too, in the head and in the shape of the spine at the end of the body.

Life-history.—The female, by means of the ovipositor, bores into the bark, laying an egg in the outside of the wood. In the elm, the larva was found on hatching to eat out first of all a vertical gallery and then abruptly to tunnel in the transverse direction, turning later towards the bark, below which pupation took place.

R. STEWART MACDOUGALL.

American Gooseberry Mildew.

The Board have already issued memoranda* on the subject of the American Gooseberry Mildew (*Sphaerotheca Mors-uvæ*, Berk.), with suggestions for the prevention and remedy of the disease. A description of the disease may now be given which will enable fruit growers to recognise it if their gooseberry bushes are found to be attacked.

This fungus is much more injurious than the allied English Gooseberry Mildew† (*Microsphæra Grossulariæ*, Lev.), as it not only attacks the leaves, but also extends to the shoots and fruit, stunting the latter and rendering it unsaleable. The disease usually first appears as a delicate white mildew on the expanding leaf-buds, extending later to the young wood and fruit. During the summer months enormous quantities of the spores are produced, these spores spreading the disease by being conveyed from infected to healthy shoots or adjoining bushes by wind, rain, insects, &c. At a later stage the patches of mildew gradually change from white to a dingy brown colour, and become densely studded with the winter fruit, which appears in the form of very minute black dots. The spores contained in the winter form of fruit germinate the following spring, and give origin in turn to the white summer mildew.

* See *Journal*, December, 1906, p. 560; and April, 1907, p. 44.

† See Leaflet No. 52 (Gooseberry Mildew).

Branch showing leaves, wood, and fruit attacked with American Gooseberry Mildew.

FIG. 1.—The Fungus on the Shoots.

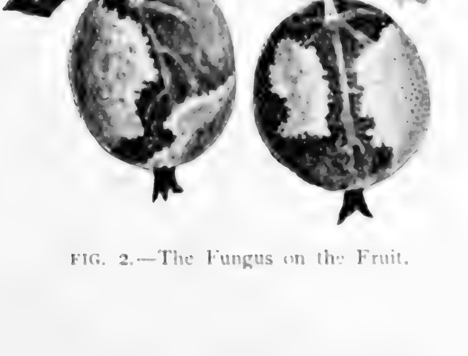


FIG. 2.—The Fungus on the Fruit.

In this country the fungus appears to be mostly confined to the tips of the shoots, which for a distance of 2 or 3 in. present a brown and shrivelled appearance, somewhat similar to that produced by an attack of "green fly." On such shoots, if carefully examined, especially with the aid of a magnifying glass, the brownish patches of mildew studded with black winter fruit can be readily seen.

The coloured plate is reproduced by permission of the Department of Agriculture and Technical Instruction for Ireland.

Sycamore Leaf Blotch.

The conspicuous black spots (*Rhytisma acerinum*, Fries.) resembling blotches of pitch, so general on living leaves of the sycamore and maple, are probably familiar to everyone, although not always associated with the work of a parasitic fungus. Towards the end of June, small yellowish patches appear on infected leaves; these patches increase in size until they are half an inch or more in diameter, and gradually darken in colour, until finally they become almost jet-black, with a border of dingy yellow. The substance of a fully formed patch is much thicker than that of the leaf proper, owing to a crust formed by the fungus. The surface of the patch is wrinkled or corrugated, and, during the summer, produces myriads of very minute spore-like bodies, the function of which is unknown. They have not been seen to germinate, and seem incapable of causing infection. During the following spring, after the dead leaves have been lying on the ground throughout the winter, spores of another kind are produced in the substance of the black patches; these spores escape into the air through gaping cracks, and if they happen to alight on suitable young leaves, infection follows.

A second fungus, called *Rhytisma punctatum*, also forms large black blotches on living leaves of sycamore and maple; it is distinguished by the black patch not being continuous, but composed of numerous minute distinct black spots, crowded together on a yellowish groundwork. The two kinds are not infrequently present on the same leaf.

When the disease is present, almost every leaf on the tree is infected, as a rule, consequently a considerable amount of

leaf surface is prevented from doing its work; and, in addition, diseased leaves fall early in the season. As the disease, unless checked, continues from year to year, the tree becomes enfeebled through lack of food, and then becomes an easy prey to a yet more destructive parasite, the Coral spot fungus (*Nectria cinnabarina*),* which almost invariably follows an epidemic of leaf blotch. The method for preventing a continuance of this disease is both simple and effective. The

Rhytisma acerinum ON SYCAMORE.

only possible means of infection of the young leaves in spring is from floating spores that have escaped from dead leaves which have been lying on the ground during the winter. If all such dead leaves are collected and burned before the young leaves unfold, the disease will be arrested.

* Leaflet No. 115 (Coral Spot Disease).

Mites on Apple Trees.

The Board have received some specimens of apple bark infested with a species of mite named *Oribata lapidaria* which was stated to be damaging apple trees. These mites lay their eggs in crevices of wood or on moss, fungi, and lichens, while other species of the family deposit their eggs on the ground. From the egg issues a tiny larval form with six legs, and after a few weeks in this stage the larva moults. The stage succeeding this moult is known as the nymph and is characterised by eight legs. The nymph moults three times, increasing slightly in size with each moult, becoming adult after the third change. The mites dislike bright sunshine and readily shelter under moss and lichen.

The best authorities on this family of mites, both in Great Britain and America, hold that they do no harm to the trees. A correspondent of the Board, however, who in 1904 sent material from an apple tree similar to that lately received, expressed the opinion, in spite of authorities quoted, that this *Oribata* caused the destruction of his fruit-crop, causing the fruits to wither and dry by eating round the root spurs.

Treatment.—The mites may be destroyed by the application of either of the following preparations :—

(1) Soft soap, 5 lb. ; paraffin, 1 gallon ; and 40 gallons of water. The soft soap should be dissolved in some boiling water and the paraffin then added, the mixture being thoroughly churned until a cream-like mass results. This "emulsion" should be brought up to 40 gallons by adding water while continually stirring.

(2) Caustic soda (98 per cent.), 2 lb. ; soft soap, ½ lb. ; paraffin, 5 pints ; soft water, 10 gallons. The soap should be dissolved in 1 gallon of soft water and the paraffin then added, and the whole churned as in (1). The caustic soda should be stirred in after dissolving in 9 gallons of soft water.

In using (2), it should be noted (*a*) that it had better be used before the buds burst, and (*b*) that as the spray is a caustic one the operator should have his hands protected by rubber gloves.

Lodging and Accommodation of Hop-Pickers.

The Local Government Board recently instructed one of their Medical Inspectors, Dr. Reginald Farrar, to enquire into the lodging and accommodation of hop-pickers and pickers of fruit and vegetables, and his report has now been issued (No. 252, Reports of Medical Inspectors, Price 1s.).

In giving some details as to the hop industry, it is mentioned that, in 1890, the cost of cultivation and of placing hops on the market was stated in evidence given before the Select Committee to be rather over £40 per acre; so that, allowing 10 cwt. to the acre to be a fair crop, a price of more than £4 the cwt. must be made in order to realise a profit. Since 1890, however, the demand for quality in hops, rather than quantity, has grown, and successfully to cultivate high-grade hops requires increasingly skilled and costly methods of cultivation, large expenditure on hop-washing (for which purpose a mixture of quassia and soft soap is generally used), and scientific methods of drying the hops. The necessary outlay on labour, machinery and plant has, according to some of the largest growers, both in Kent and Worcestershire, brought the cost of production (including the placing of hops on the market) up to a figure which is nearer £60, or even £80, per acre than £40.

Under these circumstances, the grower must either raise a crop of more than 10 cwt. to the acre, or make a price of more than £6 to £8 per cwt. in order to realise a profit on his outlay.

The effect of the changes that have taken place since 1882 is, that while the large grower or syndicate possessing capital, who can afford to practise intensive cultivation and scientific methods of drying, &c., can still make a fair profit on the growth of hops, and, by averaging the bad years with the good, or holding over the crops from one year to another, can tide over the fluctuations of crops and markets, the small farmer, possessing but little capital, cannot afford scientific culture, and cannot make headway against the fluctuations of the market, but is often, to avoid bankruptcy, obliged to sell his crop for less than the cost of production.

In consequence, there is a tendency for the smaller farmers

to be squeezed out of the industry, and for the large growers possessing capital and practising scientific methods to be left in possession of the field. This tendency is illustrated, not only by the remarkable decrease of the acreage under cultivation of hops—more than 30 per cent. of this area having been grubbed up since 1885—but by the heavy crops to the acre raised by the principal growers of the present day. One firm in Worcestershire has raised a crop of 20 cwt. to the acre, in 1906, although the crop generally has been a light one. In these days, then, the cultivation of hops is a costly business, requiring capital for its successful pursuit; and, speaking generally, the small farmer without capital cannot afford to cultivate so costly and "speculative" a crop.

The bearing of these facts on the hop-picking industry is important, for, whereas the small farmer, with whom hop-growing is a temporary venture, can only afford to make temporary, and often inadequate, provision for the accommodation of his pickers, in farm-buildings or tents, the larger growers regard, or should regard, such provision as part of their capital outlay; they can, and in most instances do, provide accommodation of a more or less permanent character, and it is both reasonable and practicable for sanitary authorities to require that such accommodation shall adequately conform to the standards prescribed in their bye-laws for the health and comfort of the pickers.

The hop-picking season commences early in September, and lasts from three to six weeks, an average season being about four weeks.

An average picker can earn about 1*s.* 6*d.* to 2*s.* 6*d.* a day in Kent. The rate in Worcestershire appears to be slightly less, but is supplemented by certain allowances of tea and sugar, vegetables, &c., and, as a rule, by an allowance of 6*d.* in respect of Sunday's dinner.

Dr. Farrar discusses in detail the result of his investigation into the accommodation provided for the pickers, and gives plans and illustrations of huts which have been specially erected on some farms and particulars of their cost. He concludes that the conditions are not generally unsatisfactory, although, in particular instances, the accommodation provided for hop-pickers affords ground for serious complaint. "It is

only fair," he says, "to record my impression that this accommodation is not, on the whole, generally unsatisfactory. There is need for improvement, both generally and in particular instances; but I gather that the conditions are already much improved as compared with those existing 30 years ago. This improvement has been continuous, and is still in progress."

As already pointed out, the tendency for the hop-growing industry to fall into the hands of farmers growing hops regularly from year to year on a large scale, and possessed of capital, tends to operate in the direction of securing better conditions for hop-pickers.

Dr. Farrar considers that it is of great importance that bye-laws should be adopted in any district in which hops are grown on an extensive scale, and that the Local Government Board's Model Bye-laws represent the minimum standard in respect of health, decency and comfort for hop-pickers. "There appears to be an impression," he says, "in districts where these bye-laws are not in force that they constitute a very stringent code. For instance, the chairman of a certain Rural District Council recently, in opposing their adoption in his district, referred to them more than once as the 'cast-iron regulations of the Local Government Board.' This same gentleman is himself a large grower of hops, and the provision made by him for his pickers is on an adequate scale, and such as to comply in essential respects with the requirements of the Model Bye-laws; but there are farms in his district in which these requirements are not fulfilled, and to which they might with great advantage be applied. It cannot seriously be contended by anyone acquainted with the conditions of the hop-picking industry that the demands of the Model Bye-laws are unduly stringent, nor is it a common experience of sanitary administration in rural districts that bye-laws are applied with 'cast-iron' rigidity."

The Report also contains some remarks on the accommodation for the temporary labourers employed in picking fruit and vegetables, and it is suggested that similar bye-laws should be adopted in those districts where these crops are grown in quantities sufficient to require the introduction of immigrant pickers to harvest them.

Co-operative Cattle Insurance Societies, 1902-05.

The Table below (published in the *Labour Gazette*, April, 1907) is compiled from returns furnished direct to the Labour Department of the Board of Trade by the societies concerned, supplemented in a few cases by particulars kindly supplied by the Chief Registrar of Friendly Societies.

The membership of these societies consists of small holders in agricultural districts who have combined together to raise, by small periodical contributions, a common fund for the mutual insurance against loss by death of their cattle, sheep, pigs, &c. One third of the societies are in Lincolnshire,* the remainder being spread over fourteen other counties in England and Wales.

The societies are all registered under the Friendly Societies Acts, but are distinguished from nearly all other societies registered under these Acts in that the contributions of their members are legally recoverable; that the liability of members is not limited; and that the amount of the insurances is not limited by the Act—although in practice it is found that the insurances are for small amounts only.

The following Table shows the membership, receipts, expenditure and total funds of Co-operative Cattle Insurance Societies for the years 1902–1905.

	1902.	1903.	1904.	1905.
Number of societies making returns ...	52	52	53	53
Total membership	3,253	3,362	3,505	3,457
	£	£	£	£
Receipts during year—				
Members' contributions	1,287	1,284	1,369	1,457
Other receipts	311	398	377	331
Total receipts	1,598	1,682	1,746	1,788
Expenditure during year—				
Benefits to members	1,306	1,267	1,375	1,242
Working expenses	194	237	204	250
Total expenditure... ...	1,500	1,504	1,579	1,492
Total funds at end of year	6,865	7,043	7,210	7,491

* See Cow and Pig Clubs in Lincolnshire, *Journal*, vol. xii, May, 1905, p. 82.

Russian Egg Trade.

The Russian egg trade, which a few years ago was considered to be scarcely worthy of notice, has developed to such a degree and attained such a position, that eggs now figure in the front rank of exports from the Russian Empire. Mr. A. Woodhouse, H.M. Consul at Riga, states that Riga is the principal port of export, though the eggs shipped thence are not gathered from the Baltic Provinces or from any of the neighbouring governments. The real egg-producing region, from which supplies are drawn for the foreign markets, may be readily traced on the map. It starts at Tchernigoff in the south-west and sweeps round in a curve towards the north-east, embracing on its way the Governments of Kursk, Kharkoff, Voronejh, Tamboff, Saratoff, Penza, Samara, Simbirsk, Nijni-Novgorod, Kazan, and ends at Viatka, but the more prolific districts are those of Voronejh, Tamboff, the Volga, and Kazan, while a large trade appears to be developing at Viatka. Eggs are also obtainable in Siberia, and at a cheap rate, but their quality is not to be depended upon.

The manipulation of the egg business in Russia has been worked up to a high degree of perfection, and the agents of the firms in this trade are legion. Every available district has been tapped, and the only areas that have not, as yet, been exploited are those without adequate means of communication.

In the region mentioned the agents are engaged from May to September or October in collecting, packing, and forwarding the eggs to the coast for shipment, but before they can be sent abroad, they are carefully sorted by experts and repacked according to class. The merchants or representatives of the Continental firms engaged in the trade, pay periodical visits to the egg districts in order to see for themselves the condition of the country, and to form some idea of the prospects for future operations.

The prices of eggs vary according to district, time of season, and class of egg, and range between 24 roubles (£2 11s.) and 50 roubles (£5 15s.) per case of 1,440 eggs, delivered at station. There is no rule by which prices are fixed, although some districts yield better eggs than others, and the merchants

in making their contracts for a season, very often run considerable risks which may only be covered by a favourable out-turn of the sorting.

The freight to a port of shipment is according to mileage, and generally calculated per waggon of 100 cases or 10 tons. From Kozloff, in the Government of Tamboff, to Riga the charge per waggon is 180 roubles (£19 3*s*.), while from Kazan to Riga it is 245 roubles (£26). The freight per steamer from Riga to the east coast of Great Britain is between 22*s*. 6*d*. and 23*s* 6*d*. per ton.

The National Poultry Organisation Society.

The National Poultry Organisation Society was established in 1898 to encourage and develop the production of poultry and eggs in Great Britain, and especially to bring producers into more direct communication with retailers, by establishing co-operative depôts for the collection of eggs and poultry. Up to the present thirty-seven branches and collecting depôts have been formed, and are doing satisfactory work in their respective districts.

At the depôts eggs are received from members of the Society and paid for at the local market price. From there the eggs are marketed for the members, after they have been tested, sorted, sized and packed, thus enabling the Society to sell them through the trade to the best advantage. It is hoped by this means after working expenses are paid to have a profit which will be divided to each member according to the quality and quantity of eggs supplied by him. Eggs are required to be sent to the depôt not less than three times a week, and it is recommended, in order to ensure their absolute freshness, that they should be gathered twice a day. Reports published by the various depôts show the profits that are realized. On the whole it may be said that the general standard of quality in the respective districts has been raised.

In addition to establishing these depôts, the Society circulates information to its members and in other ways assists and promotes the poultry industry. A list of the branches and depôts, together with other particulars, can be obtained from The Secretary, National Poultry Organisation Society, 12, Hanover Square, London, W.

Bee Disease in the Isle of Wight.

The Board have now received a report from Mr. A. D. Imms, M.Sc. of Christ's College, Cambridge, on a disease of bees, which has been prevalent in the Isle of Wight for the past two or three years. This report will be published in the next issue of this *Journal*. The disease in question seems to have first broken out in the summer of 1904, in 1906 it spread very rapidly, and at the present time it is prevalent over nearly the whole island, and in many localities it is practically an impossibility to keep bees at all. The Isle of Wight bee-keepers term the disease "paralysis," but its symptoms are not those of paralysis. As a result of the investigations, which have been made up to the present, it appears that the disease is one of the digestive system, and might be described as distension of the hind intestine. The colon and adjacent part of the rectum are enormously distended with a congested mass of material consisting chiefly of pollen grains. The distended colon exerts pressure on the large abdominal air sacs of the tracheal system and so interferes greatly with their function. The insect in this way is unable to expand them with the air, which is necessary for flight, and this feature, coupled with the additional weight in the digestive canal renders the insect incapable, when badly diseased, of flying about. The movements of the legs are not impeded, but it only seems to have energy to crawl about in a lethargic fashion. The fact that it cannot fly, is not however, due to paralysis of the wing muscles.

Affected stocks in the winter show symptoms similar to those of dysentery, and there appears to be some connection between the dysenteric conditions noted in the diseased hives and the disease under consideration. The death of the bees seems to be brought about finally by blood-poisoning, partly by the accumulation of toxins derived from the congested mass of waste material in the colon and to some extent by the imperfect oxygenation of the tissues owing to the pressure exerted on the abdominal air sacs.

The demand for nitrogenous food seems to be one of the most marked characters of the disease, but why the demand should arise is a question which it is not at present possible to answer.

Advisory Committee on Regulations under the Fertilisers and Feeding Stuffs Act.

The Board of Agriculture and Fisheries are of opinion that the administration of the provisions of the Fertilisers and Feeding Stuffs Act, 1906, would be materially assisted by the exercise of the power to make regulations as to the manner in which analyses are to be made, which is conferred upon them by Section 4 (1) (*c*) of the Act.

With a view to framing such regulations the Board have obtained the assistance of a committee of representative chemical experts to advise them as to the nature of the regulations to be made, and to prepare a draft for their consideration and approval.

The Committee will consist of the following gentlemen, viz.:—Dr. T. E. Thorpe, C.B., F.R.S. (Chairman), E. J. Bevan, Esq., F.I.C. and Dr. J. Clark, F.I.C., F.C.S. (both nominated by the Society of Public Analysts), Dr. B. Dyer, F.I.C., F.C.S., A. D. Hall, Esq., M.A., Professor E. Kinch, F.I.C. (nominated by the Chemical Society), Dr. J. A. Voelcker, B.Sc., F.I.C. Ernest Garnsey, Esq., M.Sc., will act as Secretary to the Committee.

Notes on the Weather and Crops in April.

During the *first* week in April the temperature was again above the average over Great Britain. In all the districts of England and Scotland an "unusual" amount of warmth was registered. The rainfall was less than the normal in England E. and the Midland counties; but over the whole Kingdom generally the quantity which fell during the latter half of the period exceeded the average for the week. The precipitation experienced in the South during the early hours of Sunday the 7th, which was mostly composed of snow and sleet, equalled about half an inch over a large area. Bright sunshine was "abundant" in many districts.

In the *second* week the weather was generally unsettled, with more cloud and rain over the Kingdom, as a whole, than for a long time past. Thunderstorms, or thunder alone, occurred in nearly all English districts and in the south of Scotland. The amount of warmth was "moderate" in all districts, while the rainfall was in excess of the average, except in England N.W. and Scotland N. and W. Over the southern and south-western counties of England the excess was large, the return from the latter district being "very heavy." Bright sunshine was generally "scanty."

The general character of the *third* week was fair, the rainfall being slight and infrequent and the intervals of sunshine very considerable. The temperature, however, was below the average in all districts, being "deficient" in England and Scotland, except in the eastern, midland, and south-western counties of England, where it was "moderate."

In the *fourth* week the general condition was unsettled. The warmth was "moderate" in all districts of Great Britain, except England N.E., where it was

"unusual." The rainfall varied a good deal. In England S., S.W., and E., it was considerably in excess of the average, while in Scotland E. there was a large deficiency. In other districts the divergence from the normal was less striking. Bright sunshine was "scanty" in the east of England, but "moderate" in most other districts, except the east of Scotland, where it was "abundant."

A few reports have been received from the Board's correspondents on the weather and the crops. In South-East Kent vegetation is still relatively late, but the crops generally are said to look well. Gooseberries were somewhat affected by frosts, but there is a prospect of a fair crop; and there is also a likelihood of a good crop of plums. In the Wisbech district it is reported that sharp frosts occurred on several nights, but no great amount of damage was caused to the fruit crops. The young trees, which are more exposed, suffered the most from frost, but the prospect for every kind of fruit is encouraging. Pastures are backward. In Berkshire the frosts do not seem to have done much harm to the fruit crops. Vegetation has made great progress, and the pastures are now ready to carry stock. The lambing season in Argyllshire is said to be a fair one; corn is brairding well, but grass is late.

Miscellaneous Notes.

Agricultural Education in Canada.—An educational experiment, which is about to be tried in Canada, is the introduction of classes in agriculture in some of the high schools. It is proposed to make a grant to each high school that will establish a class in agriculture, and will agree to appoint a teacher recommended by the Agricultural Department. A plot of ground must be provided near the school, to be used for demonstration or experiment. The classes will specialise according to the agricultural wants and conditions of the districts in which the schools are situated. In fruit-growing sections, particular attention will be paid to fruit culture. In grain-growing or vegetable-growing districts, those branches will receive chief attention. The teachers will devote their time exclusively to agricultural work. If their time is not monopolised in their respective schools, it is to be available for assisting and encouraging agricultural and nature study in rural schools, and in sending the Agricultural Department information as to pests, new and interesting developments in connection with farming, &c. In fact they will be the local representatives of the Department, as well as teachers.—(*Canadian Farmers' Advocate*, 7th March, 1907.)

General Education Board in the United States.—An organisation of private citizens in the United States interested in the study of educational needs, was recognised by Congress in 1903 under the title of "The General Education Board." It is intended to afford a medium through which gifts from private philanthropists can be advantageously applied to education, and has been very largely endowed by Mr. Rockefeller. No State Educational Institutions are aided from this fund. As regards agriculture, some demonstration work has been undertaken in the Southern States, where it is stated that the farmer obtains a smaller return from his land than is the case in the North, and is consequently unable to support a good school system. The Education Board has been successfully endeavouring to show farmers in three or four Southern States, by means of demonstration farms, how to make the land more productive.

The Agricultural and Horticultural Association.—With reference to the information respecting the Agricultural Organisation Society which was recently given in this *Journal* (January, 1907, p. 628), it may be pointed out that, besides the societies affiliated to that Association, there are a number of other co-operative societies, some of which have been in existence for a number of years. One of the oldest, the Agricultural and Horticultural Association, Limited, dates from about the year 1866. It is almost exclusively a society for the sale of seeds, fertilisers, oil-cakes, and other requisites to its members, as well as to the general public. The sales for 1907

amounted to nearly 57,000*l.*, and the number of shareholding members was 3,173, with 21 shareholding societies and 144 associates.

Roadside Planting of Fruit Trees.—As noted in this *Journal* in November, 1904, it is the practice in some parts of the continent to plant fruit trees in suitable positions along the roadsides in place of the ornamental or forest trees more usually employed. Visitors to certain parts of France and Germany during the spring and summer months will be struck with the appropriateness of such a practice, which is not only exceedingly picturesque but serves a useful purpose.

In Saxony, as in some other German States, use is made of the roadsides and other open spaces under public control for planting fruit trees such as cherries, apples and pears. The Board are informed through the Foreign Office that a return has just been published showing the favourable results during 1906 of such plantations on the Government roads alone. The return from fruit in 1906 was £12,235, compared with £10,907 in 1905. The Government roads at Leipzig alone produced £2,807 worth of fruit. The district which produced the least was Annaberg, but even there over £100 was collected from the sale of fruit grown along the roadside.

Solitary Bees in Wood.—The solitary bee *Megachile* and allied species are variously known as Carpenter bees, Carder bees, Mason bees and Leaf-cutting bees, according to the position and composition of their cells. *Megachile* cuts with her mandibles oval pieces of leaf from the leaves of various plants, and, choosing a gallery already made or helping to make tunnels in timber, fits the oval pieces of leaf together into a cell, being aided in her work by a secretion. In the cell, pollen and nectar are placed by the bee and an egg is then laid. The cell is next closed up, the lid consisting of round pieces of leaf, varying in number. A second cell is made above the first, and so on, the number of cells in a series varying. Several series may be made by the same bee.

In due course the eggs hatch, and the resulting grubs nourish themselves on the stored nectar and pollen. When full fed they pupate, and later the adult is ready to issue.

Danger of Poisoning from Rhododendrons.—The leaves of Rhododendrons are sometimes stated to be poisonous to cattle, and goats have been known to be poisoned by them. A correspondent enquires whether the species *Rhododendron ponticum* is at all dangerous. Cornevin in his work "Des Plantes Vénéneuses," says definitely that this species is poisonous and that veterinary authorities both in England and Belgium have published accounts of cases of poisoning both of sheep and of goats that were traced to it. There do not appear to be cases on record of cows having actually died owing to having eaten its leaves. But Cornevin remarks that farmer's will be well advised to take care that this plant, ornamental as it is, be always kept out of the reach of small ruminants. Considering its character it may be well to be on the safe side by taking the same precautions with regard to the larger animals.

Importation of Pigs into Russia.—With reference to the notice in last month's issue of the *Journal* (April, 1907, p. 35) as to a possible opening for British pigs in Russia, the Board are informed by Mr. Consul-General Murray that a sanitary certificate from the country of origin is required at the Russian frontier before swine can be imported, and that there is no duty on them.

Importation of pedigree pigs into Argentina.—Within the past year or two considerable progress has been made in the grading up of the Argentine breed of pig by importation of pedigree stock from Great Britain. According to the Review of the River Plate (15th March, 1907) many breeders have introduced pure bred animals, the number imported in 1905 being 167, and 297 in the first eleven months of 1906.

Demand for Agricultural Machinery in Smyrna.—In a report on the agricultural resources of the district round Smyrna, the United States Consul there expresses the opinion that the awakening of Asia Minor to the need of modern implements of agriculture will present a great opportunity to manufacturers. Everything needed on a farm will, he says, find a sale. At present, as a rule, the most primitive methods are in use, although many implements have been imported in recent years. A dealer in

agricultural machinery states that within the last 20 years over 60,000 American ploughs have been imported and sold. There are markets for breaking ploughs, cultivators, disks, harrows, seeders, drills, planters, rakes, mowers, binders, thrashers, engines, waggons, carriages, harness, saddles, carpenters' tools, and household utensils of every description.—(*Board of Trade Journal*, 4th April, 1907.)

Poultry Exhibition at St. Petersburg.—The Board are informed through the Foreign Office that the *Société Russe d'Aviculture* propose to hold a poultry exhibition in the autumn of this year, which will include a special section for foreign exhibitors.

Congress on the Re-afforestation of Mountains.—The Board are informed through the Foreign Office that the Central Association for the preservation and re-afforestation of mountains has organised an International Congress to be held in Bordeaux on July 19th next, in connection with the Bordeaux Maritime Exhibition. The subjects to be brought under discussion are :—(1) The methods adopted in various countries for the proper maintenance of mountain pasturage, and for the preservation from silting of rivers and harbours ; (2) The various national methods employed for the preservation of forests, and for replanting uncultivated districts, and the effects of re-afforesting upon the development of maritime transport ; (3) Enquiry into the means of co-operation between public services and private initiative for the preservation of mountains, for afforestation, and for education in forestry.

An excursion has been arranged for Monday, July 22nd, in order to enable visitors to the Congress to inspect the work already accomplished by the Association at Arreau-Cadéac, in the Upper Pyrenees.

Horticultural and Agricultural Exhibitions at Lyons.—The Board are informed through the Foreign Office that a General Horticultural Exhibition will be held in Lyons from May 16th to 20th. It is being held in connection with the National Agricultural Exhibition of Lyons, which commences on May 11th and ends on May 20th.

National Poultry Conference.—The Second National Poultry Conference will be held at Reading from the 8th to 11th July next. The conference will be divided into the following sections :—Poultry farming and production ; breeding ; hygiene and disease ; women and the poultry industry ; education and research ; and commercial poultry keeping.

The Board of Agriculture and Fisheries desire to warn all growers of potatoes that the disease known as Black Scab of Potatoes, which is prevalent in North Wales, and some of the adjacent English counties, passes in the spring from the non-infectious winter stage to the highly dangerous summer stage. As this disease, which has caused great devastation in certain districts, is of recent introduction to this country, it is believed that it can be kept in check and prevented from spreading further if due precautions are taken at once. Potato growers should therefore carefully watch their plants for any sign of the disease, and should at once destroy all infected plants. The land should then be cleaned with an application of lime, and potatoes grown in an infected area should not be used for planting. In order to assist growers to identify the disease a leaflet (No. 105) has been issued with a description and illustration, which may be obtained gratis and post free on application to the Board. The leaflet has also been translated into Welsh.

SELECTED CONTENTS OF CURRENT PERIODICALS.

Journal of Bath and West and Southern Counties Society. Fifth Series, Vol. I.

Labour Colonies at home and Abroad, and the Cry of "Back to the Land," *B. Swanwick;* Diarrhœa or "Scour" of Calves and Young Cattle, *Prof. J. Penberthy;* On Improving Cultivated Plants by Selection and Crossing, *W. Carruthers;* The Milan Exhibition in Relation to British Agriculture, *E. H. Godfrey;* Some Modern Dairy Appliances and their Use, *C. W. Walker-Tisdale;* The Feeding Value of Acorns, *J. Hughes.*

Journal of Royal Agricultural Society of England, 1906. Vol. 67.

The Place of the Small Holder in English Agriculture, *Major P. G. Craigie;* Rural Roads, *P. C. Cowan;* The Application of Mendel's Laws of Inheritance to Breeding Problems, *R. H. Biffen;* Parasites of Cattle and Sheep, *Prof. J. Penberthy;* Comparative Economy of Different Methods of Harvesting Corn Crops, *Prof. J. Wrightson;* The Trials of Suction Gas Plants at Derby, 1906, *Capt. H. R. Sankey.*

Transactions of the Highland and Agricultural Society. Fifth Series, Vol. XIX.

The Future of British Woodlands, *The Rt. Hon. Sir Herbert Maxwell*; Land as an Investment, *R. E. Turnbull;* The Booming of Fruit-Growing, *W. E. Bear;* The Chemical Composition of Butter, *Chas. Crowther;* Experiments in Crossing Potatoes, *J. H. Wilson*; Influence of Food on Milk Yield, *D. A. Gilchrist* and *C. Bryner Jones;* Poisonous Beans, *Jas. Hendrick;* On Some Injurious Insects in 1906; The Raspberry Moth; Vine and Raspberry Weevils; Ground Beetles on Strawberries; The Black Currant Gall-Mite; The Corn Weevil; The Bean Beetle; The Pine Saw-Fly; The Large Larch Saw-Fly; *Dr. R. S. MacDougall;* Milk Records—Fourth Season—Giving the Yield in Milk and Butter-Fat of 2,688 Cows, *J. Speir.*

Landwirtschaftliche Versuchs-Stationen, LXVI. I u. II.

Zur Bestimmung der Phosphorsäure in Düngemitteln, *F. Mach;* Untersuchungen über den Einfluss des Proteins auf die Milchproduktion, sowie über die Beziehungen zwischen Stärkewert und Milchertrag, *Morgen, Beger und Westhausser.*

Naturwissenschaftliche Zeitschrift Land-und Forstw. Vol. IV.

Über die Einwirkung des Kalkes auf Buchenrohhumus, *Müller und Weis.*

Journal für Landwirtschaft, 55. Parts I and II.

Kulturversuche und kritische Studien über das Wirkungsverhältnis von Chilisalpeter und schwefelsaurem Ammoniak, *Dr. H. Suchting;* Untersuchungen über die Wirkung von Kalksalpeter; Untersuchungen über die Wirkung sehr hoher Gaben von schwefelsaurem Ammoniak bei Gegenwart von organischen Substanzen und von kohlensaurem Kalk im Boden; *Prof. Dr. A. Stutzer;* Einiges über das Hederich-Spritzverfahren, spez. ein Beitrag über den Einfluss der Witterung auf die Wirkung der Metallsalze, *Hans Henneberg;* Referate über neuere Arbeiten auf dem Gebiete der Pflanzenzüchtung, *Prof. C. Fruwirth.*

Zeitschrift für Forst und Jagdwesen, 29. III.

Versuche über Forstdüngung und Bodenpflege, *Prof. Dr. Schwappach;* Der Reinertrag des forstlichen Rachhaltsbetriebes, *C. Ostwald.*

Jahresbericht über Angewandte Botanik. Part III.

Neuere Untersuchungen über Kartoffel und Tomaten Erkrankungen, *Dr. O. Appel.*

Landwirtschaftliche Jahrbücher, XXXVI. Part I.

Zur Frage der Konkurrenzfähigkeit von Gross, Mittel, und Kleinbetrieb in der Landwirtschaft, *Dr. J. Hoch.*

Annales de l'Institut Nationale Agronomique. 2e Serie. Vol. II.

Contribution à l'étude des Matières albuminoides solubles du lait, *Lindet et Ammann;* Sur quelques bactériennes observées à la Station de Pathologie végétale. Le Chancre du Peuplier: La Maladie bactérienne de la Pomme de terre; Sur la Maladie appelée "Gras de l'Oignon," *Dr. G. Delacroix;* Études experimentales sur l'Orge de brasserie, *Boullanger et Massol.*

ADDITIONS TO THE LIBRARY.

Germany—

Henne, J.—Die Schafzucht. (148 pp.) Berlin: Paul Parey, 1906. 2·50m.

Parow, Dr. E.—Handbuch der Kartoffeltrocknerei. (210 pp.) Berlin: Paul Parey, 1907.

Jahresbericht der Landwirtschaftskammer für die Provinz Brandenburg, 1905. (292 pp.)

Jahresbericht über die Landwirtschaft im K. Sachsen für 1902 (249 pp.); 1903 (248 pp.); 1904 (259 pp.) Leipzig.

K. Zentralstelle für die Landwirtschaft.—Die Landwirtschaft in Wurtemberg. (428 pp.) Stuttgart: W. Kohlhammer, 1902.

Regierungsrath Nobiling.—Die Preussischen Landeskultur-Gesetze. (878 pp.) Münster, Westphalia: H. Mitsdörffer.

Hiltner, Dr. L. Bericht über die Tätigkeit der Kgl. Bayer. Agrikultur-botanischen Anstalt in München, 1905. (139 pp.) Munich: Klock und Giehol, 1906.

Appel, O.—Zur Kenntnis des Wunderschlusses bei den Kartoffeln [reprinted from the Bericht der Deutschen Botanischen Gesellschaft]. (5 pp. + 1 plate) Berlin: Gebrüder Borntræger, 1906.

K. Biologische Anstalt für Land-und Forstwirtschaft.—Mitteilungen, Heft, 3:—Der derzeitige Stand unserer Kentnisse von den Flugbrandarten des Getreides; *und* Ein neuer Apparat zur einfachen Durchführung der Heisswasserbehandlung des Saatgutes (20 pp.) Berlin: Paul Parey, 1907.

Great Britain—

Royal Agricultural Society of England.—Journal, Vol. 67. (341 + cxxx. pp.) London: John Murray, 1906. 10s.

Bath and West and Southern Counties Society.—Journal, 5th Series, Vol. I. (226 + clxxxiv. pp.) London: Stanford, 1907. Price to Non-Members, 6s.

Liverpool University.—Institute of Commercial Research in the Tropics. Maize, Cocoa and Rubber, by Viscount Mountmorres. (44 pp.) Liverpool: at the Institute. London: Williams & Norgate. 2s. nett.

Woburn Experimental Fruit Farm.—Seventh Report. (56 pp.) London: Eyre & Spottiswoode, 1907. 1s. 6d.

Highland and Agricultural Society of Scotland.—Transactions, 5th Series, Vol. XIX. (402 + 82 + 79 pp.) Edinburgh: Wm. Blackwood, 1907. 5s.

Fisher, W. R.—Schlich's Manual of Forestry, Vol. IV. Forest Protection. 2nd Edition. (712 pp.) London: Bradbury, Agnew, 1907. 12s. nett.

Fletcher, S. W.—Soils. How to Handle and Improve them. (438 pp.) London: Constable, 1907.

Secretary for Scotland.—Crofters Commission. Report, 1906. [Cd. 3418.] (100 pp.) London: Wymans. 1s.

Wolff, Henry W.—Co-operative Banking. (301 pp.) London: P. S. King & Son, 1907. 7s. 6d. nett.

Holland—

Departement van Landbouw.—Verslag No. I., 1907. Verslag over het Landbouwonderwijs, 1904–6. (204 pp.) The Hague: J. & H. Langenhuysen, 1907.

India—

United Provinces of Agra and Oudh.—Reports for 1905–6. Administration of the Department of Agriculture. (11 pp.) 9d. Government Botanical Gardens, Saharanpur and Mussoorie. (5 pp.) 3d. Government Horticultural Gardens, Lucknow. (7 pp.) 3d. Agricultural Station, Orai, Jalaun. (15 pp. and map.) 9d. Cawnpore Agricultural Station. (38 pp.) 1s. 6d. Allahabad: 1906.

Ireland—

Royal Commission on Congestion in Ireland.—Third Report and Minutes of Evidence [Cd. 3413 and 3414]. (4 and 384 pp.) London: Wymans, 1907. ½d. and 3s. 9d. respectively.

Portugal—

Real Associaçao Central da Agricultura Portuguesa.—Congresso de Leitaria, Olivicultura e Industria do Azeite em 1905, Vol. I. (764 pp.) Lisbon: Imprensa Nacional.

Switzerland—

Secrétariat des Paysans. — Publication No. 27. Documents concernant les Ordonnances d'une Loi Fédérale sur les Denrées Alimentaires Pt. II Viandes et charcuteries, cidre, fruits, légumes et oeufs (14 pp.) No. 29:—Comité Directeur de l'Union Suisse des Paysans. Rapport, 1906. (55 pp.) Berne: K.-J. Wyss, 1907.

United States—

Jackson, C. R. and Daugherty, Mrs. L. S.—Agriculture: Through the Laboratory and School Garden. (403 pp.) 1906. *Shamel, A. D.*—Manual of Corn Judging. 2nd Edition. (72 pp.) 1903. *Powell, E. P.* Hedges, Windbreaks, Shelters, and Live Fences. (139 pp.) 1905. *Shaw, Thos.*—Soiling Crops and the Silo. (366 pp.) 1906; Forage Crops (281 pp.) 1907; Clovers and How to Grow them. (349 pp.) 1906. *Killebrew, A. M. and Mybrick, H.*—Tobacco Leaf. (506 pp.) 1906. *Spillman, W. J.*—Farm Grasses of the United States. (248 pp.) 1907. *Mybrick, H. and others.*—The Book of Corn. 2nd Edition. (372 pp.) 1904. New York: Orange Judd Company.

Plumb, C. S.—Types and Breeds of Farm Animals. (563 pp.) New York: Ginn & Company.

Bureau of Animal Industry:—

Circ. 104. Welsh Black Cattle. (29 pp.) 1907.

Circ. 105. Baby Beef. (34 pp.) Washington, 1907.

Farmers' Bulletin:—

No. 271. Forage Crop Practices in Western Oregon and Western Washington. (39 pp.)

No. 272. A Successful Hog and Seed Corn Farm. (16 pp.)

No. 273. Experiment Station Work. XXXVIII. (32 pp.)

No. 274. Flax Culture. (36 pp.)

No. 275. The Gypsy Moth and How to Control it. (22 pp.)

No. 276. Experiment Station Work. XXXIX. (32 pp.)

No. 277. The Use of Alcohol and Gasoline in Farm Engines. (40 pp.)

No. 278. Leguminous Crops for Green Manuring. (27 pp.)

No. 279. A Method of Eradicating Johnson Grass. (16 pp.)

No. 281. Experiment Station Work. XL. (32 pp.) Washington, 1907.

Forest Service:—

Circ. 22 (5th Revision). Practical Assistance to Tree Planters. (4 pp.)

Forest Planting Leaflets. Circ. 54. How to cultivate and care for Forest Plantations on the semiarid plains. (4 pp.) No. 55. How to Pack and Ship Young Forest Trees. (2 pp.) No. 56. Burr Oak. (3 pp.) No. 57. Jack Pine. (2 pp.) No. 58. Red Oak. (3 pp.) No. 59. Eucalypts. (6 pp.) No. 60. Red Pine. (3 pp.) No. 61. How to Transplant Forest Trees. (4 pp.) No. 64. Black Locust. (4 pp.) No. 65. Norway Spruce. (4 pp.) No. 66. White Elm. (3 pp.) No. 68. Scotch Pine. (4 pp.) No. 69. Fence-Post Trees. (4 pp.) No. 70. European Larch. (3 pp.) No. 71. Chestnut. (4 pp.) No. 74. Honey Locust. (3 pp.) No. 77. Cottonwood. (4 pp.) No. 78. Wood used for Packing Boxes in New England. (4 pp.)

Bull. 72. Wolves in relation to Stock, Game, and the National Forest Reserves. (31 pp.) Washington, 1907.

[Books may be borrowed from the Board's Library on certain conditions, which may be ascertained on application.]

PRICES OF AGRICULTURAL PRODUCE.

AVERAGE PRICES of LIVE STOCK in ENGLAND and SCOTLAND in the Month of April, 1907.

(Compiled from Reports received from the Board's Market Reporters.)

Description.	England. First Quality.	England. Second Quality.	Scotland. First Quality.	Scotland. Second Quality.
FAT STOCK :—	per stone.*	per stone.*	per cwt.†	per cwt.†
Cattle :—	s. d.	s. d.	s. d.	s. d.
Polled Scots	7 11	7 9	37 6	34 3
Herefords	7 10	7 5	—	—
Shorthorns	7 9	7 1	36 9	33 10
Devons	8 1	7 3	—	—
	per lb.*	per lb.*	per lb.*	per lb.*
	d.	d.	d.	d.
Veal Calves	8¾	8	8¼	6¾
Sheep :—				
Downs	8¾	8¼	—	—
Longwools	8	7½	—	—
Cheviots	9¾	9	9¾	8½
Blackfaced	9½	8½	9¼	8¼
Cross-breds	8¾	8	9¾	8¾
	per stone.*	per stone.*	per stone.*	per stone.*
Pigs :—	s. d.	s. d.	s. d.	s. d.
Bacon Pigs	6 10	6 4	6 5	5 7
Porkers	7 1	6 9	6 11	6 3
LEAN STOCK :—	per head.	per head.	per head.	per head.
Milking Cows :—	£ s.	£ s.	£ s.	£ s.
Shorthorns—In Milk	20 2	17 7	21 16	17 15
,, —Calvers	19 10	16 17	19 9	17 1
Other Breeds—In Milk ..	17 18	14 10	18 15	15 7
,, —Calvers ...	—	—	18 15	15 5
Calves for Rearing	2 3	1 15	2 13	1 16
Store Cattle :—				
Shorthorns—Yearlings ...	9 15	8 5	10 9	8 13
,, —Two-year-olds ...	13 18	11 18	15 0	12 12
,, —Three-year-olds	16 19	15 5	18 2	15 7
Polled Scots—Two-year-olds	—	—	16 1	13 8
Herefords— ,,	15 8	14 0	—	—
Devons— ,,	13 1	11 2	—	—
Store Sheep :—	s. d.	s. d.	s. d.	s. d.
Hoggs, Hoggets, Tegs, and Lambs—				
Downs or Longwools ...	50 11	45 2	—	—
Scotch Cross-breds... ...	—	—	41 6	35 10
Store Pigs ;—				
Under 4 months	29 11	22 4	22 2	17 7

* Estimated carcase weight.

† Live weight.

AVERAGE PRICES of DEAD MEAT at certain MARKETS in ENGLAND and SCOTLAND in the Month of April, 1907.

(Compiled from Reports received from the Board's Market Reporters.)

Description.	Quality.	London.	Birmingham.	Manchester.	Liverpool.	Glasgow.	Edinburgh.
		per cwt. *s. d.*	per cwt. *s. d.*	per cwt. *s. d.*	per cwt. *s. d.*	per cwt. *s. d.*	per cwt. *s. d.*
BEEF :—							
English	1st	51 6	52 6	52 6	—	56 0*	53 0*
	2nd	50 0	47 0	48 0	—	54 6*	48 6*
Cow and Bull ...	1st	41 0	45 0	44 6	39 6	44 6	43 0
	2nd	36 0	40 0	36 6	35 6	36 0	36 6
U.S.A. and Canadian :—							
Port Killed ...	1st	52 0	50 6	50 6	51 6	53 0	—
	2nd	48 6	45 6	47 6	47 0	50 6	—
Argentine Frozen—							
Hind Quarters ...	1st	30 6	32 6	31 6	31 6	34 0	32 6
Fore ,, ...	1st	26 0	27 0	27 6	27 0	27 0	29 6
Argentine Chilled—							
Hind Quarters ...	1st	41 0	43 6	41 0	40 0	—	43 0
Fore ,, ...	1st	28 6	31 0	28 6	29 6	—	32 0
American Chilled—							
Hind Quarters ...	1st	53 6	52 0	52 6	52 6	54 0	54 0
Fore ,, ...	1st	33 6	34 0	34 0	34 0	35 6	35 6
VEAL :—							
British	1st	69 0	67 6	77 6	80 6	—	—
	2nd	64 0	52 6	69 6	71 0	—	—
Foreign	1st	70 0	—	—	—	—	62 6
MUTTON :—							
Scotch	1st	76 6	—	82 0	79 6	75 0	71 0
	2nd	68 0	—	78 0	74 0	69 6	62 6
English	1st	68 6	69 0	77 0	74 0	—	—
	2nd	62 0	56 0	70 0	68 0	—	—
U.S.A. and Canadian—							
Port killed ...	1st	—	—	—	70 0	—	—
Argentine Frozen ...	1st	32 6	36 0	35 0	33 0	35 0	37 6
Australian ,, ...	1st	32 6	34 0	33 0	32 6	35 0	—
New Zealand ,, ...	1st	39 6	—	42 0	42 0	35 0	—
LAMB :—							
British	1st	102 6	97 0	108 6	107 6	—	—
	2nd	93 6	84 0	99 0	98 0	—	—
New Zealand ...	1st	51 6	51 6	48 6	48 0	55 0	56 0
Australian	1st	42 0	44 0	41 0	41 0	43 0	43 0
Argentine	1st	—	45 6	43 6	42 6	43 0	—
PORK :—							
British	1st	62 0	62 6	59 6	59 0	57 6	56 6
	2nd	56 0	55 6	56 0	55 6	56 0	48 0
Foreign	1st	59 6	58 0	57 0	57 0	—	—

* Scotch.

AVERAGE PRICES of **British Corn** per Quarter of 8 Imperial Bushels, computed from the Returns received under the Corn Returns Act, 1882, in each Week in 1905, 1906 and 1907.

Weeks ended (*in* 1907).	Wheat.			Barley.			Oats.		
	1905.	1906.	1907.	1905.	1906.	1907.	1905.	1906.	1907.
	s. d.	*s. d.*	*s. d.*	*s. d.*	*s. d.*	*s. d.*	*s. d.*	*s. d.*	*s. d.*
Jan. 5 ...	30 4	28 4	26 0	24 4	24 6	23 11	16 3	18 2	17 3
,, 12 ...	30 4	28 6	26 1	24 6	24 8	24 2	16 3	18 4	17 4
,, 19 ...	30 5	28 5	26 1	25 0	24 11	24 1	16 5	18 4	17 5
,, 26 ...	30 6	28 7	26 2	25 1	25 1	24 5	16 7	18 7	17 5
Feb. 2 ...	30 6	28 10	26 3	25 0	25 1	24 4	16 7	18 10	17 5
,, 9 ...	30 7	28 10	26 6	25 2	25 3	24 5	16 8	18 10	17 7
,, 16 ...	30 5	28 11	26 7	25 2	25 6	24 1	16 9	19 0	17 7
,, 23 ...	30 10	28 10	26 10	25 0	25 4	24 2	16 10	19 0	17 9
Mar. 2 ...	30 8	28 8	26 9	25 2	25 0	24 2	16 10	19 0	17 9
,, 9 ...	30 9	28 5	26 8	25 2	25 1	23 11	16 10	18 8	17 11
,, 16 ...	30 10	28 5	26 10	24 11	24 8	24 2	16 10	18 10	18 0
,, 23 ...	30 9	28 4	26 10	25 2	24 4	24 0	17 0	18 8	18 1
,, 30 ...	30 9	28 3	26 8	25 1	24 5	23 9	16 11	18 11	18 2
Apl. 6 ...	30 9	28 7	26 9	25 6	24 2	24 3	17 0	18 11	18 3
,, 13 ...	30 8	28 11	26 8	24 3	24 4	23 9	17 6	19 4	18 6
,, 20 ...	30 8	29 4	26 8	24 4	24 0	23 3	17 5	19 1	18 7
,, 27 ...	30 9	29 6	26 10	24 4	24 0	23 3	17 9	19 6	18 9
May 4 ...	30 8	29 10	27 0	25 3	23 10	23 6	18 0	19 9	19 3
,, 11 ...	30 8	30 1		24 10	24 1		18 3	20 0	
,, 18 ...	30 10	30 3		24 8	23 10		18 5	20 1	
,, 25 ...	30 11	30 4		24 4	24 2		18 8	20 2	
June 1 ...	31 3	30 4		23 6	22 10		19 1	20 5	
,, 8 ...	31 4	30 3		24 0	23 4		18 11	19 11	
,, 15 ...	31 7	30 4		26 0	23 6		19 1	20 2	
,, 22 ...	31 7	30 5		23 9	22 10		18 10	20 2	
,, 29 ...	31 8	30 3		23 2	24 3		19 7	20 1	
July 6 ...	32 1	30 2		22 11	23 0		19 6	20 2	
,, 13 ...	32 3	30 5		23 10	23 8		19 7	20 4	
,, 20 ...	32 2	30 3		23 7	23 2		18 11	20 5	
,, 27 ...	32 3	30 5		23 11	22 4		19 3	20 2	
Aug. 3 ...	31 11	30 9		22 0	22 1		18 4	19 3	
,, 10 ...	30 5	30 5		22 5	23 0		16 11	17 11	
,, 17 ...	28 5	29 0		23 4	24 2		16 4	17 0	
,, 24 ...	27 1	27 9		23 6	25 0		15 9	16 10	
,, 31 ...	26 11	26 9		23 5	24 3		15 9	16 6	
Sept. 7 ...	27 1	26 4		23 4	24 9		15 11	16 3	
,, 14 ...	26 11	25 11		23 7	24 3		16 0	16 1	
,, 21 ...	26 8	25 9		23 10	24 3		15 11	16 0	
,, 28 ...	26 9	25 9		24 3	24 8		16 1	16 2	
Oct. 5 ...	26 9	26 1		24 9	25 0		16 3	16 3	
,, 12 ...	26 11	26 3		24 10	25 3		16 6	16 7	
,, 19 ...	27 1	26 6		25 0	24 10		16 7	16 8	
,, 26 ...	27 4	26 7		24 11	24 10		16 8	16 10	
Nov. 2 ...	27 10	26 7		24 9	24 8		17 1	16 11	
,, 9 ...	28 3	26 6		24 10	24 8		17 4	17 1	
,, 16 ...	28 7	26 4		24 6	24 4		17 8	17 2	
,, 23 ...	28 5	26 3		24 6	24 1		17 9	17 3	
,, 30 ...	28 8	26 1		24 6	24 1		17 11	17 2	
Dec. 7 ...	28 6	26 1		24 7	24 1		17 11	17 4	
,, 14 ...	28 5	26 1		24 5	23 11		17 11	17 3	
,, 21 ...	28 4	26 3		24 6	24 3		17 11	17 3	
,, 28 ...	28 3	26 0		24 7	24 1		18 1	17 3	

AVERAGE PRICES of **Wheat**, **Barley**, and **Oats** per Imperial Quarter in FRANCE, and BELGIUM and GERMANY, and at PARIS, BERLIN, and BRESLAU.

—		WHEAT.		BARLEY.		OATS.	
		1906.	1907.	1906.	1907.	1906.	1907.
		s. *d.*	*s.* *d.*	*s.* *d.*	*s.* *d.*	*s.* *d.*	*s.* *d.*
France :	March ...	39 10	40 0	25 2	26 8	22 3	22 11
	April ...	39 10	38 9	25 3	26 2	22 4	22 10
Paris :	March ...	40 6	40 0	25 3	27 3	23 2	23 0
	April ...	40 2	39 10	25 5	26 7	23 3	25 6
Belgium :	February ...	30 11	28 5	24 4	25 3	21 9	20 0
	March ...	30 3	28 10	24 6	25 7	21 5	20 6
Germany :	March ...	37 8	40 0	27 10	29 1	23 0	24 10
	April ...	38 9	41 1	28 7	29 9	23 10	25 4
Berlin :	February ...	39 1	40 3	—	—	22 9	24 11
	March ...	38 3	41 2	—	—	22 9	25 5
Breslau :	February ...	35 3	37 7	25 1	29 7 (brewing) 23 3 (other)	20 8	22 5
	March ...	35 2	37 3	27 9 (brewing) 25 1 (other)	29 7 (brewing) 23 11 (other)	20 7	23 0

NOTE.—The prices of grain in France have been compiled from the official weekly averages published in the *Journal d'Agriculture Pratique*; the Belgian quotations are the official monthly averages published in the *Moniteur Belge*; the German quotations are taken from the *Deutscher Reichsanzeiger*, the prices for the German Empire representing the average of the prices at a number of markets.

AVERAGE PRICES of **British Wheat, Barley,** and **Oats** at certain Markets during the Month of April, 1906 and 1907.

—	WHEAT.		BARLEY.		OATS.	
	1906.	1907.	1906.	1907.	1906.	1907.
	s. *d.*	*s.* *d.*	*s.* *d.*	*s.* *d.*	*s.* *d.*	*s.* *d.*
London...	29 8	27 6	23 0	23 11	20 0	19 4
Norwich	28 11	26 4	23 7	24 0	18 3	18 3
Peterborough	28 9	25 11	23 5	22 4	19 1	17 11
Lincoln...	29 0	26 5	23 10	22 5	18 11	18 6
Doncaster	28 3	26 4	23 9	23 7	18 11	18 8
Salisbury	29 3	26 10	24 8	22 9	18 8	18 3

AVERAGE PRICES of PROVISIONS, POTATOES, and HAY at certain MARKETS in ENGLAND and SCOTLAND in the Month of April, 1907.

(Compiled from Reports received from the Board's Market Reporters.)

Description.	London.		Bristol.		Liverpool.		Glasgow.	
	First Quality.	Second Quality.	First Quality.	Second Quality.	First Quality.	Second Quality.	First Quality.	Second Quality.
	s. d.	*s. d.*	*s. d.*	*s. d.*	*s. d.*	*s. d.*	*s. d.*	*s. d.*
BUTTER :—	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.
British ...	13 6	12 0	13 9	12 0	—	—	13 9	—
	per cwt.	per cwt.	per cwt.	per cwt.	per cwt.	per cwt.	per cwt.	per cwt.
Irish Creamery	100 0	96 0	103 6	101 0	95 0	92 0	96 0	—
,, Factory	94 0	90 0	96 0	89 0	88 6	82 6	—	—
Danish ...	106 0	104 0	—	—	103 6	99 0	104 0	—
Russian ...	93 6	91 0	—	—	90 6	86 0	—	—
Australian ...	97 6	95 0	100 0	91 0	95 6	92 0	100 0	95 0
New Zealand	100 0	97 0	103 0	99 6	100 0	97 0	101 0	—
CHEESE :—								
British—								
Cheddar ...	86 0	82 6	84 0	72 0	82 0	78 0	72 0	66 0
					120 lb.	120 lb.		
Cheshire ...	—	—	—	—	74 0	69 0	—	—
					per cwt.	per cwt.		
Canadian ...	66 0	65 0	66 6	64 0	65 0	63 6	66 0	64 0
BACON :—								
Irish	65 0	62 0	—	—	65 6	61 0	64 6	62 0
Canadian ...	57 0	55 0	59 0	54 6	56 0	51 6	58 6	54 6
HAMS :—								
Cumberland ...	106 0	102 0	—	—	—	—	—	—
Irish	102 0	95 6	—	—	—	—	82 0	78 0
American (long cut) ...	60 6	59 6	59 0	56 0	61 0	56 6	60 0	58 0
EGGS :—	per 120.	per 120.	per 120.	per 120.	per 120.	per 120.	per 120.	per 120.
British ...	8 11	8 4	7 3	—	—	—	—	—
Irish	8 0	7 6	7 6	7 0	7 6	7 0	7 6	6 11
Danish ...	8 6	7 7	—	—	7 6	7 0	7 7	7 1
POTATOES :—	per ton.	per ton.	per ton.	per ton.	per ton.	per ton.	per ton.	per ton.
Main Crop ...	96 0	88 6	97 6	82 6	95 0	86 6	65 0	60 0
Scottish Triumph ...	92 6	83 6	92 6	75 0	83 6	75 0	—	—
Up-to-Date ...	93 6	85 0	92 6	82 6	83 6	75 0	71 0	66 0
HAY :—								
Clover ...	100 6	89 6	90 0	82 6	100 0	77 6	83 6	78 6
Meadow ...	96 6	85 6	85 0	75 0	—	—	82 6	77 6

DISEASES OF ANIMALS ACTS, 1894 to 1903.

NUMBER of OUTBREAKS, and of ANIMALS Attacked or Slaughtered.

GREAT BRITAIN.

(From the Returns of the Board of Agriculture and Fisheries.)

Disease.	April.		4 Months Ended April.	
	1907.	1906.	1907.	1906.
Swine-Fever :—				
Outbreaks	200	126	675	361
Swine Slaughtered as diseased or exposed to infection ...	1,001	761	3,471	1,808
Anthrax :—				
Outbreaks	117	74	372	332
Animals attacked	182	146	528	519
Glanders (including Farcy) :—				
Outbreaks	69	81	305	367
Animals attacked	152	143	700	683
Sheep-Scab :—				
Outbreaks	31	23	376	267

IRELAND.

(From the Returns of the Department of Agriculture and Technical Instruction for Ireland.)

Disease.	April.		4 Months Ended April.	
	1907.	1906.	1907.	1906.
Swine-Fever :—				
Outbreaks	7	7	48	16
Swine Slaughtered as diseased or exposed to infection ...	158	46	892	260
Anthrax :—				
Outbreaks	1	—	1	2
Animals attacked	3	—	3	2
Glanders (including Farcy) :—				
Outbreaks	—	—	—	2
Animals attacked	—	—	—	7
Sheep-Scab :—				
Outbreaks	15	12	147	127

THE JOURNAL

OF THE

BOARD OF AGRICULTURE.

Vol. XIV. No. 3.

JUNE, 1907.

REPORT ON A DISEASE OF BEES IN THE ISLE OF WIGHT.

In consequence of numerous reports which were received as to the occurrence of a very serious disease among bees in the Isle of Wight, the Board of Agriculture and Fisheries requested Mr. A. D. Imms, B.A., M. Sc., of Christs College, Cambridge, to undertake an inquiry into the nature and cause of the disease. Mr. Imms has now furnished the Board with the following Report on the result of his investigations.

The Isle of Wight bee-keepers term the disease "paralysis," but its symptoms do not agree with those of the ordinary disease of bees which bears that name.

Geographical Distribution.—So far as has been ascertained by personal inquiry, the disease appears to have been first observed in the south-eastern area of the island, somewhere in the neighbourhood of Wroxall. Bee-keepers all state that they were not troubled with the disease previous to 1904, and it is said to have broken out in the summer of that year. During the year 1906 it spread very rapidly, and in the spring of 1907 it was prevalent over nearly the whole of the island, and in most localities that have been visited it was practically an impossibility to keep bees with any profit. The following are the principal places where the disease has been ascertained to occur :—Near Blackwater, Bembridge, Bonchurch, Brook, Chillerton, Freshwater, Great Whitcombe, Hampstead, Newport, Porchfield, Ryde, St. Helen's, Sheat, Shalfleet, Shanklin, Thorley, Ventnor, Yafford, Yarmouth, Wellow, and Wroxall.

Inquiries from a bee-keeper in Cowes early this year showed that the disease had apparently not yet reached that district, and at Norton, near Yarmouth, the disease was also stated to be absent.

Losses Sustained through the Disease.—In almost all the cases that I have personally investigated, the disease was found to be so prevalent as to render it practically an impossibility to keep a healthy stock for twelve months. Within one mile radius of Upper Lea Farm, Thorley, there were about seventy stocks in the winter of 1905. In March, 1907, there were under eight and some of these were diseased. A bee-keeper in Shanklin has lost twenty stocks out of twenty-two, and three other bee-keepers in the same district have lost their whole stock, consisting of 12, 8, and 4 hives respectively. A bee-keeper in Brook has lost all his hives—numbering twenty-eight—and similar destruction has been personally met with at Sheat, Great Whitcombe, Ryde, and Porchfield, where all the hives have been destroyed. In Freshwater there are about a dozen bee-keepers, but none had any living hives so far as could be ascertained. Furthermore, almost all the bee-keepers can give information of similar instances which it has not been possible to investigate personally. The greatest loss that has come under my notice is in the case of one bee-keeper who has lost over fifty hives.

In some few cases the destruction has been obviously hastened by dirt and neglect, but in most cases the hives were well-cared for, and in only one instance were the bees kept in the old-fashioned skep type of hive.

With few exceptions the bee-keepers are disinclined to pursue the practice another season until they can hear of some remedy which will combat the disease.

Suggested Causes of the Disease.—Several suggestions have been put forward by the more experienced bee-keepers ; some are inclined to think that it is due to some poisonous plant, while others put it down to artificial manures or to blight. On further inquiry none of these suggestions were found to be based on a single well-ascertained fact.

In some instances, I have been informed, healthy swarms have been purchased from the South of England and in a week these were dying off by hundreds. In other cases apparently

healthy swarms commenced to die off twenty-four hours after the disease had been detected. Other cases have come under my notice in which the bees have died off in batches each day and it has been going on for several weeks. Some strains of bees appear to be capable of resisting the disease for a longer period than others, but all eventually succumb to the complaint.

Several bee-keepers say that the disease is least prevalent at the time when the Dutch clover is in full blossom.* This coincidence may perhaps be on account of the plant containing some ingredient which renders the bees better able to withstand the disease, but positive information on this point remains to be obtained.

Secondary Effects of the Disease.—Hives attacked by the disease are liable to "chilled brood" which kills off large numbers of the young and developing generation. The weakened bees are unable to withstand the onslaughts of robbers, and the latter were often in evidence around infested hives, and the destruction of a diseased colony is further hastened by the Wax Moth, which soon gains an entrance into a feebly-defended hive. In Brook it was ascertained that both the large and small species of this moth attacked the hives.

Symptoms of the Disease.—The earliest noticeable symptom of the disease is the inability of the affected bees to fly more than a few yards without alighting. As the disease progresses, the bees can only fly a few feet from the hive and then drop and crawl about aimlessly over the ground. They are often to be seen crawling up grass stems, or up the supports of the hive, where they remain until they fall back to the earth from sheer weakness, and soon afterwards die. In a badly infected stock great numbers of bees are to be seen crawling over the ground in front of the hives, frequently massed together in little clusters, while others remain on the alighting board. If the hives be opened, numbers of diseased individuals will be often met with inside. They are found clustered together around the queen and show very little inclination for movement until disturbed and are entirely unable to fly. Badly diseased individuals show very little inclination for stinging; those that are less severely attacked often sting very actively.

* Three bee-keepers have independently informed me of this fact.

If a badly diseased bee be carefully examined it will be seen to have lost its power of flight, and it crawls about with the hinder extremity of the body dragging on the ground; frequently it walks about with its wings "out of joint," the hind wings protruding obliquely upwards and above the anterior pair. The only other external symptom of the disease is seen in the abdomen, which is frequently distended beyond its normal proportions. This distension, however, is not by any means constant, and was chiefly noticed in the case of the native bee; in the half-breed with the Italian bee, with its longer and slightly more slender abdomen, no unusual distension could be observed.

The disease appears to differ from what is usually termed "bee-paralysis," in that the infected individuals do not exhibit the characteristic black and shiny appearance, and neither I myself, nor any bee-keepers who have paid attention to the disease, have observed the curious trembling motion of the limbs and body which is regarded as a symptom of that disease.

The disease appears to be entirely confined to the adult bees, the brood remaining unaffected. I have conducted a microscopical examination of a large number of eggs, larvæ at all stages of development, and pupæ, and have failed to detect anything of a pathological nature among the brood. All had the characteristic pearly white appearance of healthy specimens although belonging to a badly infected hive. The eggs were undergoing development and showed not the slightest trace of discolouration or shrivelling, the larvæ were healthy in every way and were coiled up in their normal attitude, and nothing wrong could be detected with the pupæ or the newly hatched bees.

A number of hives have been examined which have been completely destroyed by the disease, and the last remnant of the colony to die was in each instance found grouped together around the queen. That the queen is almost the last member of a hive to succumb is also in accordance with the experience of bee-keepers in the island.

Affected stocks examined in early spring show symptoms similar to those of dysentery. The bees discharge their excrements over the combs and on the sides, floor, and alighting board of the hive, and the dry fæces take the form of a long streak

of a dirty red-brown material. The bee-keepers state that this condition is only present after the winter confinement within the hive. A comb constructed by a diseased stock during the summer does not reveal any indications of dysentery being present in the hive.

After the winter is over and the bees are all on the wing, no dysentery is noticeable, and all the diseased bees that have been dissected showed the opposite condition of distension of the gut. The digestive system of a large number of diseased bees has been examined microscopically, the bees being taken from infected hives from four different localities. In all instances the colon was found to be filled with a yellowish-brown material, and in many cases it was greatly distended with it. When these contents are dried in contact with the atmosphere they assume the same colour as the excrement noticeable inside the hives at the close of winter. Microscopical examination reveals the presence of an enormous number of pollen grains differing in their species in different bees. An examination of this pollen has shown that no particular type of grain is present in all diseased bees. In addition to pollen, a variable quantity of a bright yellow amorphous material is also present.

Nature of the Disease.—The disease is eminently one of the digestive system and might be described as being a condition of enlargement of the hind intestine. Over 150 diseased bees have now been examined and all have been found to exhibit the same symptoms.

The colon and adjacent part of the rectum are enormously distended with a congested mass of material, consisting primarily of pollen grains (Fig. B). The distension is so marked that this section of the alimentary canal becomes extended from two and a half to four and a half times its normal capacity. When the dorsal integument of the bee is removed, the greater part of the abdominal cavity is seen to be occupied by the very greatly enlarged hind intestine. In extreme cases the rectum almost as far as the anus is also distended and the small intestine as well. At first sight it would appear as if the chyle stomach was greatly distended, but further examination shows that the latter becomes pushed to some extent out of its normal position and is partially flattened by the pressure that is exerted upon it. The greater part of the abdominal cavity, which is normally a

hæmocoelic space, is thus occupied, and, furthermore, the distended colon exerts pressure on the large abdominal air sacs of the tracheal system and so interferes greatly with their function. The insect is therefore unable to expand them with sufficient air, which is necessary for flight, and this feature, coupled with the additional weight in the digestive canal, renders the insect incapable, when badly diseased, of flying about. The movements of the legs are not impeded, but the insect only seems to have energy to crawl about in a lethargic fashion. The fact that it cannot fly is not due to paralysis of the wing-muscles; diseased bees have been kept under observation and occasionally they have been seen to vibrate their wings actively with a familiar buzzing sound. Moreover, if a diseased bee be held under the thorax lightly with a pair of forceps it will vibrate its wings very rapidly in its efforts to free itself, thus showing that there is no paralysis of the wing muscles. Bees in the last stage of the disease, however, do not seem to have strength to move their wings at all.

While the hind intestine is thus gorged with pollen, &c., the stomach and the remaining portion of the digestive canal contain very little solid matter of any description. Some amount of a dark-coloured fluid is present very often in the chyle stomach, but it is not distended with it.

The contents of the rectum and colon are represented in Fig. C. They consist of pollen grains for the most part, together with a variable quantity of a bright yellow substance in amorphous masses, and a large number of bacteria. There is no individual type of pollen grain common to all the bees examined (the digestive contents have been studied in about 100 examples) but in an individual bee there has always been found one species of pollen in much greater abundance than the others. Thus Fig. C represents the usual types of pollen grains found in diseased bees received from Thorley. The grains *p* 1 predominate, *p* 2 are also common, while *p* 3 are few and far between. By counting the number of grains visible in the field of a Zeiss lens, objective D, and eye-piece 2, it was found on an average that 80 *p* 1 and 6 or 7 *p* 2 are present to every single one of *p* 3. Fig. D represents the usual kinds of pollen seen in the colon of diseased bees, obtained from Great Whitcombe, in which about 60 of *a* are present to about 7 of *b*, and

FIG. A.

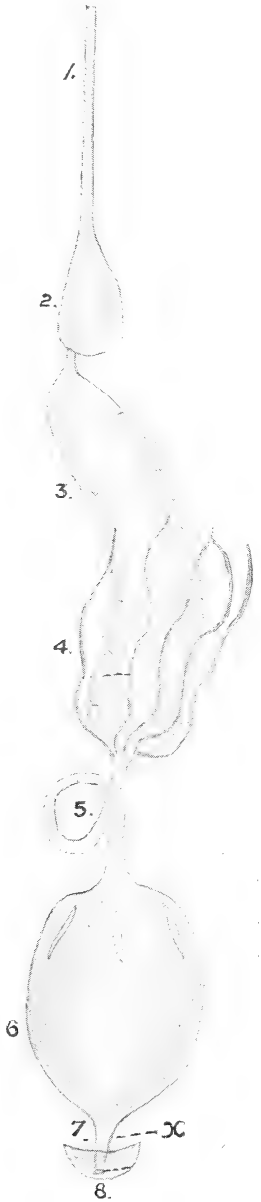


FIG. B.

Fig. A.—Digestive canal of a healthy bee. Fig. B.—Digestive canal of a diseased specimen, showing greatly enlarged hind-intestine characteristic of the disease (x = point of obstruction). The figures in both cases represent the digestive canal dissected out and extended. Fig. B is drawn from an average case; the distension is often proportionately much greater than is here figured.

1. Aesophagus. 2. Honey stomach. 3. Chyle stomach. 4. Malpighian tubes. 5. Small intestine. 6. Colon. 7. Rectum. 8. Anus.

but 1 of *c*. Very occasional grains of other species are always met with in addition. These facts demonstrate that the bees have a partiality for a particular species, but do not confine their attention solely to it. A healthy bee out on a foraging expedition confines itself to a single type of plant.

The contents of the pollen grains were found for the most part to be partially digested and in many cases only the empty coats were remaining. They are but little crushed or distorted and their species could probably be identified if necessary.

I have not seen a single diseased bee carrying pollen in the "pollen basket" situated on the posterior legs. What pollen they collect they apparently eat.

The yellow amorphous material (*c* in Fig C) is another constant feature; thus in forty-seven diseased bees from Thorley, specially examined for this substance, all contained an abundance of it; in twenty-one bees from Shanklin, all except two contained the substance, and in about a dozen bees from Great Whitcombe it was found to be present in all of them. The nature of this substance from an examination made for me by Professor T. B. Wood, M.A., of Caius College, leaves but little doubt that it is ordinary beeswax. In my own tests I found it to be unaffected by water, alcohol, osmic acid, or strong acetic acid. With strong sulphuric acid it rapidly turns a dirty green colour, while with nitric acid it rapidly loses its bright yellow colour and becomes greyish. It is soluble in both chloroform and xylol and partly soluble in potassium hydroxide, and when warmed on a glass plate it rapidly melts. In many cases this material seems to have been formed around a pollen grain, or several of the latter as a nucleus, and, after treatment with caustic potash, they are often visible in the centre of the yellow material. In a very few instances a few stellate plant hairs (very like those of *Deutzia gracilis*) have been found among the contents of the colon, and in two cases they were noticed to serve, as it were, as a nucleus for this substance to be deposited around.

The obstruction in the digestive system is situated in the rectum itself, about the point x in Fig B. The muscles of the rectum are tightly contracted and no pollen is able to pass through.

Smears made from the contents of the colon and fixed by heat

FIG. D.

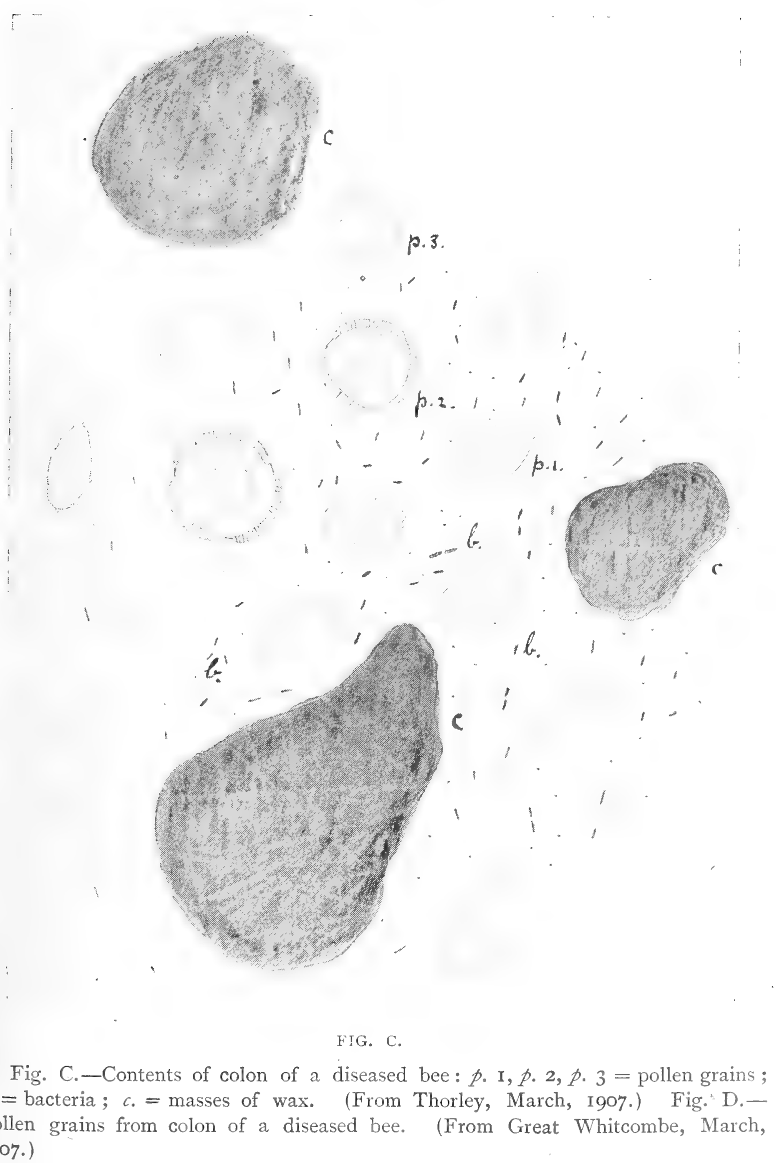


FIG. C.

Fig. C.—Contents of colon of a diseased bee: *p.* 1, *p.* 2, *p.* 3 = pollen grains; *b.* = bacteria; *c.* = masses of wax. (From Thorley, March, 1907.) Fig. D.—Pollen grains from colon of a diseased bee. (From Great Whitcombe, March, 1907.)

in the usual way known to bacteriologists, show large numbers of bacteria. The latter take the form, for the most part, of thick short rods, and are readily demonstrated by staining with carbol-fuchsin.

An examination of the blood has also been made; samples of blood were obtained (*a*) by removing a leg; (*b*) by removing the dorsal wall of the thorax. The blood preparations were stained in some cases with Leishman's stain and in others with carbol-fuchsin, but in no instance was any conclusive evidence of bacteria obtained.

The blood showed a great paucity of corpuscles and contained large numbers of minute highly retractive "granules." They are visible in all the films made and do not appear to stain. There are none of the large fat globules present as figured by Cheshire in the blood of healthy bees.

The stored pollen from a diseased hive has also been examined and smears made in the same way as in the case of the blood. A few bacteria in the form of short rods were to be detected.

At the present time cultures are in progress and samples from the contents of the colon, from the blood, and from stored pollen have been taken. These have been incubated in broth and plated in gelatine, and have been kept at room temperature and at 37° C. No growth of any kind has resulted from the blood, a very slight growth from the pollen, and a very mixed growth of bacteria and a yeast (in small numbers) from the colon. The bacteriological work cannot be fully reported on or any conclusions drawn from it. If any conclusions are to be drawn from it, it is necessary to infect healthy stock with the germs that have been isolated.

Possible Connection between the Present Disease and "Dysentery."—Under normal conditions hybernation entails very little wear and tear to the bees themselves, and consequently tissue metabolism is comparatively small. The necessary food under such conditions comprises but a small quantity of pollen, which alone results in the accumulation of any solid residue on the hind gut. If, however, through neglect or an unusually severe or very damp winter, the inmates of a hive get chilled, "dysenteric conditions" often supervene. The bees attempt to counteract chilling by "flapping" their wings and

by means of other movements. This production of heat is naturally brought about at the expense of the tissues, and carbohydrate food is insufficient to make good the wear and tear. Nitrogenous food becomes necessary and pollen is, therefore, consumed in large quantities. Under these circumstances the bees frequently discharge themselves over the comb, as already noted in a previous paragraph, on account of the gut being overcharged with pollen. This condition is not, however, apparently true dysentery, for, according to Cheshire, the latter is due to a fungoid (yeast ?) growth causing the distension of the hind gut.

There appears, however, to be some connection between the "dysenteric conditions" noted in the diseased hives and the disease at present under consideration. Possibly the former renders them predisposed to the latter, or they may be phases in one and the same disease. It has been already mentioned that the excrements appear to be similar in both cases.

It is noteworthy that about 5 per cent. of the diseased bees kept under observation have been noticed to discharge their excrement. This fact seems to suggest that the disease may possibly be amenable to the action of some suitable drug mixed with the food of the bees.

The death of the bees seems to be brought about finally by blood-poisoning, partly by the accumulation of toxins derived from the congested mass of waste material in the colon, and to some extent by the imperfect oxygenation of the tissues, owing to the pressure exerted on the abdominal air-sacs.

The demand for nitrogenous food seems to be one of the most marked characters of the disease, but why the demand should arise is a question which it is not possible at present to answer. As an experiment it might be worth while to supply liquid nitrogenous food and to remove the greater part of the pollen from the combs in winter.

Remedies tried by Bee-Keepers.—Numerous remedies have been tried by different bee-keepers. The most successful case appears to be that adopted by a Shanklin keeper, who has successfully brought hives over from last year by feeding with cane sugar, and up to the present they seem to be perfectly healthy. Others, however, have tried the remedy without any success. Several bee-keepers have tried re-queening, but

only eventually to lose their stock. Importation of new swarms from the mainland has not been attended with any success. Syrup medicated with naphthol beta, izal, and with sulphur have all been experimented with, and also alcohol. Dusting with sulphur has also been tried, and also dusting and medicated feeding combined. No permanent success has attended any of these measures.

Remedial Measures Suggested.—I would suggest that all the remaining diseased stocks be destroyed and the hives be thoroughly charred inside and out and afterwards repainted. All instruments used in connection with bee-keeping should be well disinfected. During the coming winter all fresh and already existing healthy stocks should be well looked after and kept warm, dry, and well ventilated, and every care taken that no chilling or damping takes place. Whenever possible on warm days the bees should be allowed to take cleansing flights and be confined as little as possible. The tendency of the bees to distend themselves with pollen should be prevented as far as possible by removing the greater bulk of the stored pollen, and such nourishment as is obtained from the latter should be supplied to them in a liquid form mixed with the artificial food. The bee-keepers are advised to experiment with beef jelly or a meat extract of a similar nature. This should be mixed with enough water to make it fluid and then strained through very fine muslin and mixed thoroughly with honey or a suitable sugar syrup (both methods should be tried). Several pounds of the mixture should be given at a time in the early autumn and placed in the top story of the colony to be fed, just about night-time. This will give the bees a chance of storing it away quickly, and care should be taken that they have plenty of the food.

This course of treatment is suggested as worthy of a trial, but it has not yet been possible to test its value experimentally.

A number of bee-keepers have been visited on the island and have supplied information. The writer is especially indebted to the following among others :—Mr. H. M. Cooper, of Thorley; Messrs. F. Rigby and J. W. Cooper, of Shanklin; Dr. R. Conyingham Brown, of Parkhurst; Rev. R. L. Morris, of Brook; Captain Fane, of Ryde; and Mr. C. Collister, of Bembridge.

April, 1907. A. D. IMMS.

AGRICULTURAL ARBITRATION IN SCOTLAND.

Isaac Connell, S.S.C.

In view of the provisions of the Agricultural Holdings Act, 1906, agricultural arbitrations are likely to be more numerous in future than hitherto, and as the largeness of the expenses attending these arbitrations has been one of the main grounds of objecting to them, the question naturally arises, can anything be done towards keeping these expenses within more reasonable limits ? A considerable experience in connection with arbitrations has suggested the following observations on that subject and also on the manner in which arbiters are wont to deal with questions regarding expenses generally.*

To some extent the ground of objection referred to was removed by the passing of the Agricultural Holdings (Scotland) Act, 1889 (now repealed), which put it in the power of either party (landlord or tenant) to have the arbitration conducted by a single arbiter, thus saving the fees of a second arbiter and an oversman. The Agricultural Holdings Act, 1906, goes a step further, by rendering it compulsory in all cases to have only a single arbiter. So far there has been progress in the direction of economy.

It is notorious, however, that a very large—frequently a too large—proportion of the expenses consists of the fees and outlays payable to the clerk in the arbitration, which sometimes exceed the amount payable to the arbiters.

Almost the first step taken by some arbiters on appointment is to appoint a solicitor as clerk and leave him to conduct the whole procedure in its least as well as in its most important detail. The clerk conducts all the correspondence, attends at hearings, and even accompanies the arbiters at the inspection of the farm. Is this course, which invariably leads to great expense, really necessary ? I do not think so, at all events at so early a stage.

In many cases the arbiter ought to be able to do the whole work without the assistance of a clerk, and some arbiters rather pride themselves in following this course. In very few cases

* These observations are made solely with reference to practice in Scotland, although they may be found to have some application in England as well.

is a clerk really needed till after the parties have lodged their claims and stated their objections. If it should appear from the nature of the claims and objections that the arbitration is likely to be attended with difficulty, the expediency of consulting a solicitor at that stage can scarcely be doubted. It is not, however, always necessary or desirable even in such cases to appoint a clerk to the effect of leaving the whole of the formal procedure to him. In many instances, on getting legal advice on points of difficulty, there is nothing to prevent the arbiter from attending himself to the formal procedure. In this way a good deal of expense may be saved. A solicitor, on being appointed clerk, invariably charges according to a scale of fees which is appropriate enough to important arbitrations in which large sums are at stake, but entirely out of place in the generality of agricultural arbitrations in which the amount involved rarely exceeds £100 or £200. The suggestion here made is that except in large and difficult cases a clerk need not be appointed, and that it should often suffice to consult a solicitor in connection with difficulties as they arise. Of course, this is on the assumption that the arbiter has had some experience of arbitration procedure.

With a view to this course being more generally followed, the following statement of usual procedure may prove serviceable :—

1. On receiving his appointment the arbiter may wait seven or eight days. Indeed, it is generally desirable he should do so, because "further" claims may be brought into the arbitration within seven days after his appointment.

2. Thereafter, in view of the fact that by the Statute his award requires to be issued within twenty-eight days after appointment, he may address a letter to each party, asking him to lodge any claims and vouchers within a stated period.

3. Having received and perused the claims, he may ask each party to state in writing any objections to them.

4. At this stage—not sooner—it may possibly become expedient to consult a solicitor. If there be only a claim by the tenant for improvements under the Holdings Acts and no objections excepting to the amount claimed, there would appear to be no necessity for appointing a clerk or consulting a solicitor, because such a claim is generally disposed of on the vouchers after inspecting the farm and hearing parties. If, however,

landlord or tenant states objections to the competency of the claim involving questions of law, such as may arise in connection with the nature of the claim, the time when it was lodged, whether it is barred by clauses in lease or agreement providing substituted compensation, or if either party claims for breach of contract or of the conditions of the lease, it may generally be safest to consult a solicitor accustomed to deal with such matters. Having got legal advice, the arbiter should generally without delay announce his decision on the point at issue. This course is preferable to that of waiting till the issue of the award, because (1) it would give parties an opportunity of having a case stated for the opinion of the court on any question of law involved, and (2) it may save the trouble and expense of leading evidence on part of the claim which the arbiter intends to rule out as incompetent.

5. After disposing of the objections in the manner above suggested, the arbiter, if he has sufficient facts to enable him fairly to dispose of the questions before him, may proceed to issue notes of his proposed award, otherwise, unless parties concur in lodging a joint minute of admissions sufficient to enable him to reach a decision, he ought to allow a proof either generally or limited, as the circumstances may require.

6. After the proof the arbiter may again wish to consult a solicitor. The evidence led may enable the arbiter to deal with objections regarding competency of the whole or part of the claim—objections which could not be dealt with apart from the evidence. For example, there are frequently legal questions regarding the competency at the end of the lease of claiming for breach of the conditions of tenancy. The answer often depends on whether rent has regularly been paid without reservation of claims, or whether the landlord or tenant has acquiesced in the breach. These are matters of fact which could only be ascertained either by the admission of parties or in the course of a proof. Here again the arbiter should be careful to announce his decision on these points before issuing his award, otherwise it may be too late for the parties to obtain a decision of the court on any point of law in dispute.

It is, of course, essential that the arbiter should deal impartially, and he should not fail to act in accordance with the following rules :—

1. Give both parties equal opportunities on every point and at every stage of the arbitration.

2. Hear both parties and accept evidence from both or from neither. If the question be a purely expert one on which the arbiter is competent to decide without evidence, he is not bound to hear evidence; he is generally the judge as to whether evidence is necessary, but he must act reasonably and fairly to both parties.

3. He must act in accordance with the Statutes and particularly with the Second Schedule to the Act of 1900. He has no right to waive any legal conditions or requirements, whether as regards the time for lodging claims, the condition for requiring "further" claims to be brought within the arbitration, or the time for issuing award, &c.

Objections are frequently taken to the manner in which arbiters deal with the question of expenses. They too often act as if no part of the expenses of the parties is part of the expenses in the arbitration. Accordingly it is usual to find the fees and expenses of the arbiter and his clerk allocated in a particular way, while each party is left to pay his own expenses. This is often unfair. The expense to which a party is put by having to establish his claim in the arbitration may frequently be quite as much a debt properly due to him by the other party as the claim itself.

Take a simple case. A tenant claims £100. The landlord makes no tender and contests the claim. The tenant is successful in getting an award for either the whole or a large proportion of the amount. Is it not plain that the expense which the tenant incurred is due to the unreasonable attitude of the proprietor? Why then should the proprietor not pay that expense as well as the fees of the clerk and arbiter?

It is not possible to lay down rules which shall apply to all circumstances, but the following may be of some assistance:—

1. The successful party should generally get his expenses.

2. The party who is awarded a substantial sum is successful, even though he has not got all he claimed.

3. If a party claims under different heads and fails entirely under any head, he ought to bear such expense as was incurred through claiming under that head.

4. Although the Act of 1900 (Second Schedule) provides that

the arbiter shall, in awarding costs, take into consideration the reasonableness or unreasonableness of the claim of either party, either in respect of amount or otherwise, and generally the whole circumstances of the case, the amount of claim is not of itself material to the question. It all depends on the further question whether additional expense has been needlessly incurred in consequence of the largeness of the claim. The person claiming £200 for artificial manures and receiving £100 may be entitled to get all his expenses, where no increase of expense was occasioned by the largeness of his claim.

5. If a party gets less than he is tendered, he is unsuccessful. If he gets more than he is tendered, he is successful.

6. If a party refuses to show to the other party vouchers and to give other reasonable facility for checking his claim, he is not entitled to take any advantage from the absence of a tender.

7. Where both parties are mutually successful, it is not always equitable to make each pay half the expenses of the arbiter and clerk and bear his own expenses. Greater discrimination is frequently necessary, because from the nature of the claims, double the expenses may quite properly be required to establish the one claim than the other. For example, an ordinary claim by a tenant may be disposed of on the vouchers and without proof, while a long and expensive proof may be necessary to establish a claim at the proprietor's instance for breach of contract or of the conditions of lease. Therefore the proper course is to take into consideration the proportion of the expenses incurred in connection with the respective claims and make the loser pay the expense in connection with the claim in which he was unsuccessful.

Generally, the person responsible for causing expense should pay for it. Keeping in mind that a party should not be held responsible for expense which he had properly to incur in order to establish his claim in which he has been substantially successful, the arbiter has the delicate duty of fixing the responsibility with due regard to all the equities of the case.

THE UTILISATION OF PEAT LAND ON THE CONTINENT.

The extent of peat land in several Continental countries is very considerable, and much attention has been directed to the question of the different means of utilising these unproductive stretches of country. In Germany the peat area is estimated to be about 30,000 square kilometres (more than 11,000 square miles), while in Sweden nearly 13,000,000 acres are said to consist of moor and turf. In Austria again, extensive tracts of moorland exist, which are officially returned at some 100,000 acres, though the area is believed to be understated. This class of soil occurs also in Holland and Denmark. The problem of the best method of turning these waste lands to some profitable use may be approached from two sides, either as regards the industrial use of peat for fuel, for fibre, fodder, litter, &c., or agriculturally with a view to the reclamation and cultivation of the soil.

As regards the industrial products fuel is perhaps the most important, and there are three kinds of peat fuel commonly employed in Europe :—(1) The "cut peat" prepared by cutting the crude peat out of the bog in blocks and drying in the air ; (2) "machine peat," procured by pulping the wet material, sometimes with the addition of water, and then cutting or moulding into blocks and drying with or without artificial heat ; and (3) "peat briquettes," made by artificially drying and compressing powdered peat. Peat charcoal is also made.

Another way in which peat is used industrially is in the manufacture of peat moss litter, peat dust, and peat fibre. Peat dust (Torfmull) is used for disinfecting purposes, for preserving meat, fish, and fruit, and for the filling-up of walls and ceilings, &c. Peat moss litter (Torfstreu) is very valuable as a substitute for straw, as it is very absorbent and prevents the escape of nitrogen in the form of ammonia. The material used for these products is the layer lying between the living vegetation, which usually covers the surface of peat moors, and the true black turf which is used as fuel. This upper layer was first employed for the preparation of litter and similar absorbent products, and for this purpose the fibrous portion of the peat was removed. It was somewhat difficult to find a method of utilising this fibrous product, but about 1880 an

outlet was found for it in the manufacture of paper. A few years later it was observed that this fibre could be readily cleaned and bleached, and the material so prepared could be spun into yarn. Since then the preparation of peat fibre for textile purposes has received much attention, especially in Austria, Sweden, Holland, and Germany. It is usually mixed with 6 to 25 per cent. of wool or cotton. Very many other substances are now manufactured to a greater or less extent from peat, such as paraffin, alcohol, creosote, tiles, and bricks for paving purposes, cardboard, pasteboard, &c. Some information as to the utilisation of peat for fuel and fibre appeared in the *Bulletin* of the Imperial Institute (Vol. III., 1905, p. 166), from which it seems that peat fibre is not made in Great Britain, although an attempt was made to manufacture the product in Yorkshire a few years ago. At present litter and similar materials appear to be the only products other than fuel made from peat in this country.

Societies for the purpose of encouraging the development of peat lands, both agriculturally and industrially, exist in Germany, Sweden, Denmark, Holland and Austria, while there are a number of State experimental stations and moor farms devoted to the same object. One of the most important societies, the German "Association for the Encouragement of Moor Cultivation," has been in existence for twenty-five years, and now numbers 908 members, including 81 foreign members. It held its first exhibition at Berlin in 1904, where everything connected with the subject was displayed. One of the most interesting features was the exhibition of specimen products, such as wheat and oats, potatoes of large size and excellent quality, beet-roots, turnips, onions, cabbage, celery, hay, &c. These exhibits were accompanied by samples and analyses of the soil in which they grew and statements of the quantities of fertilisers used. There was also a large show of implements, artificial manures, and industrial products.

Another important society on similar lines is the Swedish Moor Association, which was founded in 1886, and has chemical and botanical laboratories at Jönköping, with an experimental garden, a library, and museum. At Flahult, some seven miles distant, the Society has an experimental farm of 300 acres, where field experiments are carried out, and also two small model

moor farms of about 20 acres each for demonstration purposes. This Society has 3,352 members and receives a State grant.

Apart from these private associations there are a number of experiment stations in Germany and Austria. In Bavaria there is the Royal Bavarian Moor Cultivation Institute at Munich, which has four experimental stations at Bernau, Pulling, Erding, and Karlshuld. There is also an experimental station at Bremen which dates from 1877, and one at Admont, near Salzburg in Austria, which is a branch of the Imperial Agricultural Experiment Station at Vienna.

The classification,* which is usually adopted on the Continent, recognises two principal types of peat land, according to the plants from which they are formed, viz.: lowland moor (Flachmoor), swamp, marsh, or bog land, and upland moor (Hochmoor).

The first is chiefly formed from the following species:—*Phragmites, Carex, Juncus, Equisetum,* and *Hypnum.* This type of moor or marsh naturally occurs in districts liable to floods from rivers and small watercourses, and in the neighbourhood of ponds, lakes, &c.

Upland moor, not liable to floods, is formed of *Sphagnum,* with which cotton-grass (*Eriophorum vaginatum*) frequently occurs. Other plants which are found are the *Vaccinium Oxycoccos, Vaccinium uliginosum, Vitis-Idea and Myrtillus, Andromeda polifolia, Rhynchospora alba, Scheuchzeria palustris, and Ledum palustre.* In dry places, *Calluna vulgaris, Molinia,* and *Cladonia* are frequent. Moors in which both types are intermixed are also common.

Moorland in general may be regarded as land poor in nutritive elements with unfavourable physical conditions, and the first step is to change as far as possible the physical conditions so that cultivated plants may be able to exist. This can only be effected by drainage, which admits the air and allows of the decomposition of the peat. The matted structure of the turf breaks down and the peat turns finally after cultivation into a black crumbly mass. Moreover, after draining, the peat contracts and the moor settles, frequently to a very noticeable degree. Several methods of removing the superfluous water can be adopted, such as deep open ditches, pipe drains, and

* See "Anleitung zur Durchführung Moorstatistischer Erhebung." *Zeitschrift für Moorkultur und Torfverwertung*, Part I, Vol. IV, 1906.

various kinds of bush drains. Drain pipes are very liable to be displaced in consequence of the softness of the ground, but in experiments at the Bernau Experiment Station the following plan has been found satisfactory, subject to modifications to suit local conditions. Ditches are dug about 2 ft. wide and rather over 2½ ft. deep, about 65 ft. apart on some suitable system according to the lie of the land. The vegetation is then thoroughly destroyed by hoeing, roots and stumps removed, and the whole surface levelled and if possible harrowed two or three times. In the following spring the ditches, which will have settled during the winter, are deepened to about 4 ft., earthen drain pipes carefully laid, and the ditches filled in. The pipes may, if the nature of the subsoil makes it necessary, be supported by wooden laths placed underneath to keep them in position.

Two less expensive methods are recommended by Dr. Bersch,* the Director of the Admont Station, as very suitable where the pipes are liable to displacement. In places where rough boards and waste wood from saw-mills can be obtained cheaply, the drainage can be effected by placing boards at the bottom of a ditch with supports between, so as to leave open spaces for drainage. A somewhat similar method consists in the use of thin poles from the undergrowth of alder, mountain pine, birch, &c., a material which exists in abundance on most Alpine moorlands, and has hardly any value as timber. A ditch is dug about 2½ ft. wide at the top, 1 ft. wide at the bottom, and about 4½ ft. deep. Two stout sticks about 2½ ft. long with their ends against the side of the ditch are then placed crosswise over a strong rail, which is laid on the bottom of the trench and which prevents them sinking in the soft ground. These cross sticks are placed at distances about 3 ft. apart and leave a considerable opening for drainage. They serve as supports for three or four stout alder or pine poles, which are laid on them and bear the weight of the earth when the ditch is filled in, thus preventing the "drain" from sinking. The space between the poles is filled in with loppings from boughs, &c., and the whole covered in, so that the upper layer of soil is again placed on top. A wooden pipe hollowed out of a stout pole may be also inserted to secure free drainage. This method, according to Dr. Bersch, is preferable to any

* "Die Praxis der Moorkultur." *Zeitschrift für Moorkultur und Torfverwertung.* I. IV, No. 3, 1906.

other system where the material is available, because so little risk is involved. It is so simple that it can be carried out by any intelligent workman without technical help, a stoppage of the drains practically never occurs, and the aeration of the soil is quite satisfactory. The fall should not be less than 3 per 1,000.

Drainage is much to be preferred to open ditches, as apart from the loss of land, drained soil dries and is accessible very much earlier in spring. Land drained by open ditches becomes frozen not only from above, but also from the sides of the ditches, and drainage can only take place after the ice has melted. Drains on the other hand, continue to act in winter, especially when the land is deeply covered in snow. This has been frequently proved at Admont, where it was found that a pipe or bush-drained area of 5 acres could be cultivated nearly three weeks earlier than adjoining land drained by open ditches. The distance apart of the drains is of the greatest importance and must receive careful consideration in connection with the rainfall and its distribution over the year, as although insufficiently drained land can be improved by laying further pipes, over-drained land can only with great difficulty be put right. The purpose for which the land is to be used must also be considered as the water level must be reduced more for tillage than for grass.

When the drainage has been carried out, the land must be grubbed, ploughed, and harrowed. Any strongly built plough may be used, the horses being shod with broad wooden shoes, to which they soon accustom themselves. Disc harrows and strong cultivators are also useful, but if horse implements cannot be used the work must be done by hand.

The general term "moorland" covers a very great variety of soils and the method of cultivation and treatment must be varied to suit each individual case. Some indication of the variation in their chemical composition may be obtained from the figures in the following table given by Dr. Bersch in the article mentioned above. The percentage composition of the dry matter in peat soils does not afford a satisfactory indication of available plant food owing to variations in density, and for purposes of comparison the quantity of chemical constituents present in 1 hectare (2·47 acres) of soil, 20 c.m. (7·87 inches deep) is also given.

Character of Soil.	Per Cent.			
	Nitrogen.	Potash.	Phosphoric Acid.	Lime.
Light loamy sand	0·048	0·035	0·026	0·039
,, loam	0·151	0·440	0·125	0·550
Heavy loam	0·325	0·665	0·178	3·028
Calcareous sandy loam	0·172	0·333	0·180	10·048
Samples of soil from low moorland (flachmoor).				
From Laibacher Moor	2·15	0·14	0·22	3·63
,, Galicia	3·31	0·10	0·30	9·86
,, Galicia	1·96	0·08	0·47	0·86
,, Northern Tyrol	2·89	0·15	0·37	5·23
Samples of soil from upland moor (hochmoor).				
From Leopold's Moor, near Salzburg	1·46	0·12	0·08	0·50
From Ibm Moor, near Salzburg	0·63	0·13	0·02	0·57
,, Freundsheim, Tyrol (a mixed moor)	1·18	0·26	0·08	1·04
From Gutenbrunn, in Lower Austria	1·52	0·20	0·20	0·56

Character of Soil.	Quantity Contained in 1 Hectare of Surface 20 c.m. Deep, in Kilos.			
	Nitrogen.	Potash.	Phosphoric Acid.	Lime.
Light loamy sand	1,440	1,050	780	1,170
,, loam	4,530	13,200	3,750	16,500
Heavy loam	9,750	19,950	5,340	98,400
Calcareous sandy loam	5,160	9,990	5,400	314,400
Samples of soil from low moorland (flachmoor).				
From Laibacher Moor	11,103	723	1,136	18,746
,, Galicia	14,789	446	1,340	44,054
,, Galicia	10,752	439	2,578	4,717
,, Northern Tyrol	15,067	782	1,929	27,266
Samples of soil from upland moor (hochmoor).				
From Leopold's Moor, near Salzburg	2,609	214	143	893
From Ibm Moor, near Salzburg	1,670	345	53	1,511
,, Freundsheim, Tyrol (a mixed moor)	4,689	1,033	318	4,133
From Gutenbrunn, in Lower Austria	2,535	333	333	1,434

The richness in nitrogen of low marshy moorland makes any addition of nitrogenous manures generally unnecessary, and it is the natural stores of nitrogen which make the cultivation of this type of land so advantageous. Upland moor, on the other hand, is apt to be very poor. The content of both in phosphoric acid and potash is small, but lime is generally unnecessary though it is useful in some cases to sweeten the soil and hasten decomposition. Experiments in Germany have shown that its place, especially in the early years, can well be taken by basic slag.

In soils poor in nitrogen, farmyard manure supplemented by nitrate of soda or sulphate of ammonia is recommended; the dung brings with it bacteria, which, as these soils are generally very poor in micro-organisms, are of value. As regards phosphoric acid, basic slag is found to be the most useful manure, though superphosphate may also be used. Potash may be supplied in the form of kainit. The land requires manuring annually, and the following figures are given by Dr. Bersch as indicating the limits of the quantities usually necessary :—

—	Low Moorland.		Upland Moor.		
	1st Year.	2nd Year.	1st Year.	2nd Year.	3rd Year.
	Pounds per acre.				
Phosphoric acid...	90–135	55–90	180–270	90–180	45–55
Potash	110–180	70–110	180–270	90–180	90–180
Nitrogen ...	...	...	45-68	27–45	27–45

Moorland naturally requires somewhat heavy manuring, which must be given in the spring as the heavy winter rains would wash it away if applied in autumn. On the upland moors the first crop selected, both in Bavaria and Austria, is potatoes, which give a high yield and leave the field clean, while the hoeing which the crop receives much contributes to a good tilth.* In the first year the manure applied per acre represents 180 lb. to 270 lb. phosphoric acid, the same amount of potash, and 68 to 90 lb. nitrogen. The superphosphate and potash is spread broadcast before planting, and the nitrate of soda is given

* See "Bayerns Moore und ihre Kultur." *Fühling's Landw. Zeitung*, June 15, 1906.

about three weeks after. In the second year about 110 lb. of phosphoric acid and the same quantity of potash are applied, with about 40 lb. of nitrogen as a top-dressing. Potatoes are not planted after the second year, as the yield diminishes very much. The maximum yield obtained reaches 10 to 15 tons per acre.

The crop selected in Bavaria in the third year is normally winter rye, which receives about 110 lb. of potash, half that quantity of phosphoric acid, and 40 lb. of nitrogen.

In the fourth year, oats are grown or the land is laid down to grass. In either case liming is usually desirable, but only a small quantity, about 5 cwt. per acre, appears to be used. If oats are grown the manure applied is similar to that for rye but with rather less nitrogen. Before laying the land down to grass, other fodder crops can be grown, such as peas and vetches, but deep rooting plants, such as turnips, kohl-rabi, or carrots are not reliable. Many garden vegetables are found to do well if heavily manured, and also strawberries.

Although the cultivation of field and garden crops is found to be thoroughly satisfactory, experience on the upland moors of Bavaria is not favourable to laying down of permanent pasture. Grass is found to grow very well for the first two or three years, after which it deteriorates and the land has to be ploughed up. The crop from rotation grasses and clovers is, however, said to be very good if suitably manured.

Low-lying moor or fen land presents different conditions, and in some cases by manuring with basic slag and kainit a great improvement can be effected in the natural flora without previous cultivation. It is usually better, however, to break up the soil, take one or two crops, and then about the third year sow grass and clover.

Some other crops, such as maize, vines, and hops, have also in individual instances been cultivated on moorland. With regard to the latter crop, its cultivation seems to have met with considerable success in Austria in the neighbourhood of Salzburg,* where it has been grown since 1900 and where some 125 acres are now planted with hops. The plantations made in 1901 yielded 8 cwts. per acre in 1903, 13 cwts. in 1904, and

* *Zeitschrift für Moorkultur*, Vol. IV, No. 1, 1906.

$13\frac{1}{2}$ cwts. in 1905, while those planted in 1903 yielded about $6\frac{1}{2}$ cwts. in 1904 and 1905. These figures are stated to compare favourably with the yields obtained in hop-growing districts in Bohemia, and the quality is also quite satisfactory. The success which has attended the cultivation of hops here, if not necessarily applicable to moorland elsewhere, affords an example of the capabilities of such soils when properly cultivated and suitably situated.

Reference may also be made to the method of reclamation practised at the Swedish Experiment Station at Jönköping,* Here the draining is done by open drains $1\frac{1}{2}$ ft. deep, about 40 ft. apart, which are led into a large main drain The heather is then cut and removed and some levelling done. Next sand is carted or brought by light tramway and spread 2 or 3 in. deep over the levelled ground and about 30 barrels of lime per acre are also used. As soon as possible this is worked into the soil by means of cultivators or disc harrows, and it is allowed to rest for a season. The ground is then manured in accordance with the results obtained from the experimental plots, and afterwards cropped. The crops most cultivated are peas, beans, rye, oats, mangolds, potatoes, rye grass and clovers. It is not considered advisable to leave the land in grass more than five or six years. As the bog is reclaimed, the intention is to portion it out in holdings of 20 to 25 acres each and let them to tenants.

The system of sanding the surface of the bog is much practised in Germany, where it was first introduced by Rimpau on the Cunrau Moor. Here the subsoil consists of sand, which is thus available at a very low cost, and it is only where this is the case that the method can be adopted with success. Generally speaking, however, experience on the Continent shows that the reclamation of moorland, when properly carried out, proves a very satisfactory undertaking, both from a financial and an economic point of view. Economically it is, of course, very desirable to bring this waste land under cultivation, and financially the capital invested in the improvement returns a very fair rate of interest. The Prussian Forest Administration, for instance, which has improved some 15,000 acres,

* *Journal of Irish Department of Agriculture*, Vol. IV, p. 463, March, 1904.

obtained from 8½ to 24 per cent. interest on the capital outlay.

Lack of experience and knowledge on the part of practical farmers form perhaps one of the principal obstacles to the execution of work which is on every ground desirable, and it is the recognition of this fact which has led to the establishment in Germany, Austria, and elsewhere of experiment stations and farms. These serve as centres for the dissemination of information and advice on the subject, and, besides providing a demonstration of different methods, conduct actual trials on a practical basis and carry out scientific research.

Notes on Insect, Fungous and Other Pests.

A number of specimens of insects and fungi are submitted to the Board for identification, and as the information which is supplied as to treatment and preventive measures may be useful to others, it is proposed to insert in the *Journal* month by month short notes on those insect, fungous and other pests which are not dealt with in the Board's leaflets or which appear to be of general interest, together with notes of the apparent prevalence of any species.

Ants.—Several complaints have been received of ants attacking the apple, plum, black currant, &c., enquiries coming from Tewkesbury, Ilfracombe and Llanarth. In combating ants, the best results have been obtained by the use of bisulphide of carbon. The insects should be traced to the nest, in which a hole should be made with a blunt stick to a depth of 1 to 2 feet. Into this hole about 2 oz. of bisulphide of carbon should be poured, and the hole stopped up with a lump of clay. The bisulphide of carbon vaporises and the poisonous fumes suffocate the inmates of the nest. The operation should be carried out in the evening, and if the nest is a very large one several holes may be advisable or a second treatment may be necessary. If the ants are spread over a considerable surface and cannot be traced to their nest, then holes should be made in the infested soil at intervals of a yard, and into these the bisulphide should be poured. At the time of carrying out the operation the soil should neither be very wet nor very dry. In a wet clay soil the fumes diffuse too slowly, while in a dry light soil they diffuse too rapidly.

In using bisulphide of carbon it should be borne in mind :—(1) That the fumes are poisonous and should not be inhaled by the operator ; (2) that both the liquid and the fumes are inflammable and explosive, and therefore no naked light must be brought near it, not even a lighted pipe ; and (3) the liquid must not be allowed to reach the roots of trees and plants, to which it would be injurious.

Mites.—Many specimens of mite-infested crops have been received, the majority showing that the black currant gall mite (*Eriophyes ribis*) is widely prevalent. This pest is described in the Board's Leaflet No. 1. The pear leaf blister mite (*Eriophyes pyri*), of which specimens reached the Board from Wrexham during May, may be eradicated by hand-picking and burning all infested leaves not later than July. During April and May, infected trees and all surroundings should be thoroughly treated with the spray recommended in Leaflet No. 1 (The Black Currant Gall Mite) for *Eriophyes ribis.* Specimens of *Oribatid* eggs on apple-blossom were sent from Huntingdon. For an account of the mite *Oribata lapidaria*, see this *Journal*, May, 1907, p. 108.

Certain species of mites, examples of which were received from Glasgow, are known frequently to infest houses and furniture, two of the most common being *Glyciphagus domesticus* and *Glyciphagus spinipes.* Both of these mites flourish abundantly in dried animal and vegetable matter, *e.g.*, hay, straw, beans, horse-hair, sateen, &c. The eggs hatch into six-legged forms ; a fourth pair of legs appears after a moult, and then after three further moults the adult condition is reached. Some of the mites of the same family as *Glyciphagus* have a stage in their life-history known as the hypopus stage, when the mites are provided with suckers by which they can cling to passing animals—mice, flies, &c.—and so be spread. The hypopus stage in *Glyciphagus* is only partially developed, but it is at least a resting resistant stage in which the mite may be spread. Very many experiments have been made with a view to ridding houses and furniture of these pests, but so far nothing has been so successful as fumigating with sulphur. Sulphur used against mites of another, but related, family has also proved very satisfactory. Fumigation should be carried out more than once, in view of the possibility that the eggs may not be affected.

To kill the mites that issue from eggs, therefore, a second fumigation with sulphur should follow in ten days.

Dust Beetles.—Some specimens of old oak timber forwarded from Southampton during March were found to have been attacked by one of the so-called "dust" beetles, the species probably being *Anobium tesselatum*, one of the largest. This beetle is 6 mm. or more in length, and is dark brown in colour with yellowish or whitish pubescent patches or spots. It lays its eggs in timber, and the grubs, on hatching out, continue the tunnelling. The beetle is often termed the Death-watch, owing to the ticking noise caused by the beetles striking the wood with their hard jaws. This they do in order to attract one another, but the noise has given rise to various superstitions. A characteristic point in the work of these beetles is that the actual exterior wood (save for the flight holes of the adult beetles) may not show the damage, which is internal, and the damage may, therefore, remain unnoticed for a time. In movable furniture the pest may be combated, but in a wide-spread infestation, for instance, in a roof, treatment is difficult. If the infestation is limited, infested planks should be removed and burned. Where it is possible to run paraffin into the burrows this treatment would kill both beetles and larvæ. As a protective measure against such beetles the wood may be painted (or, better and surer still, impregnated) with corrosive sublimate dissolved in methylated spirit, or copper vitriol, chloride of zinc, or arsenious acid. If any of these are used it should be noted that they are dangerous poisons.

In dissecting the specimens of timber two beetles which act as followers of *Anobium* were found, viz.: one called *Cryptophagus* and one *Anthrenus*. The former belongs to an obscure family, the larvæ having been found in both old wood and dried straw. The species of the genus *Anthrenus* possess the characteristic of living on any dried material, such as old wood, furs, dried specimens of plants and animals, horse-hair in furniture, &c. In the timber under notice the active agent of destruction was *Anobium tesselatum*, *Cryptophagus* and *Anthrenus* acting as scavengers.

Wasps.—The question of the harm done by wasps and the desirability of their destruction has been raised by correspondents in the Isle of Wight and Cambridge, one of whom

has collected and destroyed during May about 1,000 queen wasps by paying $\frac{1}{2}d$. each for them to boys and others. Each queen wasp destroyed means one nest the less, as the queens are the foundresses of the colonies in the spring, they being the only wasps which survive the winter.

From a general knowledge and observation of the life-history and food-habits of wasps, it is natural to expect that there will be two opinions, one in favour of the wasps and one against them. One group of wasps, the Solitary Wasps, make burrows and store in these, for the sake of their larvæ, many species of insects and spiders. These Solitary Wasps, which are not so numerous as the ordinary Social Wasps, can sting severely; they may be regarded as useful insects.

The food habits of Social Wasps, on the other hand, are varied. For themselves, and for the sake of their young, insects of all kinds are willingly taken, viz., other and smaller wasps, flies, caterpillars, aphides, exposed grubs, &c. That insects often form a food willingly taken by wasps has been proved by actual observation of the wasps themselves and of their castings, as well as of the contents of the alimentary canal of the wasp larvæ fed by the nurses. Wasps have further been found swarming in fields, *e.g.*, bean fields where aphides abounded. In relation to plants, moreover, wasps are often most useful agents in pollination.

On the other hand, butchers' shops are entered by wasps and the surface of raw beef gnawed and the juices taken. Grocers' shops are also entered, and sweets such as sugar and jam are stolen and carried away. Wasps are sometimes the cause of great loss to fruit-growers and gardeners by injuring and devouring apples, pears, cherries, plums, grapes, &c. Men at work in the fields engaged in budding fruit-trees are occasionally driven from their work by the stings of the insects, while agriculturists engaged in ploughing and having accidentally turned up wasps' nests, have had to beat a hasty retreat, whilst the horses, maddened by the stings, have stampeded.

One of the largest of our wasps, the hornet, occasionally does harm by stripping the outer bark from young plants, *e.g.*, ash, oak, birch, lime, willow, for material for its nest-making.

From the foregoing it will be seen how difficult it is to lay

down any hard-and-fast rule about wasps and their harmfulness. In general terms it may be said that in bad wasp years, *i.e.*, in years when wasps are abundant, the nests should be destroyed. Whether a year is likely to turn out a bad wasp year or not will depend to a large extent on the character of the preceding spring. On the return of warm spring weather the queens which have been hybernating issue from their winter quarters, each to act as the foundress of a new colony. If the spring be an early one and the weather remain genial, then the year will be likely to show more than the usual abundance of wasps. If, however, there be some genial weather early in the year a certain number of queens will be tempted out from their winter shelter-places, and if severe weather or wet, cold weather follow, a number of these will perish, *i.e.*, unsettled weather in spring with renewed alternations of warm and cold or dry and wet weather will mean a greater mortality of queens, and the number of wasps in the summer will vary accordingly.

When wasps' nests are to be destroyed, this may be done by the use of bisulphide of carbon, 1 oz. of which should be poured into the hole, if this be in the ground, and the hole then stopped up in the way suggested for the treatment of ants.

Snow Fly.—A note on Snow flies appeared in this *Journal* in June, 1904, and specimens of Brussels sprouts and tomatoes infested with these insects, which are also termed Ghost flies and White flies have recently been received from Moreton-in-Marsh and Louth. Snow flies (*Aleyrodes*) belong to the same order as aphides and scale insects. The progress of the attack is usually from the lower leaves upwards. Although the flies breed in winter as well as in summer, they are most abundant in the late summer and early autumn. When mature they look like powdery moths.

Snow flies are sometimes most harmful to the cabbage and allied species, but they are common both under glass and in the open. The damage is done by the insect in its various stages draining the sap from the leaves by means of a proboscis or beak which it pushes below the surface. Where the leaves are badly infested they should be pulled off and burned ; they should not merely be thrown aside, for the complete life-cycle of an individual does not take long and may even be completed on leaves thrown aside if they are fairly fresh. Any of the sprays or

washes recommended against aphides or plant lice (see Leaflet No. 104) are effective against snow-flies if the spray used really reaches the insects, but as these are found on the *under* surface of the leaves (where also the eggs are laid) spraying should be done carefully to ensure the under surface being wetted. In an ordinary garden or on a small area good results can be obtained by placing here and there among the attacked plants newly-tarred or varnished boards, which act as traps. The boards may usefully be attached to stakes. Fumigation with hydrocyanic acid gas has, however, been experimentally found to be the best method of combating *Aleyrodes* in glass-houses.

Larder Beetle.—A species of beetle submitted to the Board, and stated to be infesting a large ham and bacon warehouse, was found to be *Dermestes lardarius*, or the larder beetle. Both adult and larva are harmful, the latter having been recorded as attacking many kinds of animal food. The eggs are laid by the beetle in any crevices, and hence in covering up hams, &c., care should be taken that there are no chinks through which the female can introduce her eggs, or through which the larvæ can crawl on hatching. The life-history can be passed through rapidly, six to eight weeks only being necessary to complete a generation.

Where articles in a store are attacked, the best plan, if at all feasible, is to fumigate with hydrocyanic acid gas or (preferably perhaps) with bisulphide of carbon. The fumigation would need to be repeated in a fortnight in order to destroy the larvæ which had meanwhile hatched from eggs unharmed by the first fumigation. In one recorded case of a bad infestation, advantage was taken of the fact that the beetles were fond of cheese. Pieces of cheese were placed about openly, the beetles were attracted, taken by hand, and destroyed. The process was continued and relief obtained from the infestation. Once overcome, the beetles may be kept out by screening windows, &c., with fine wire gauze. Where any hams or pieces of bacon have been infested, the portion affected should be cut away and the surface rubbed or washed with a strong solution of salicylate of soda or salicylic acid.

Weevils.—Several species of weevils have been submitted for identification, among them being specimens of the granary or corn weevil (*Calandra granaria*) from Presteign, where they

appear to have occurred in oats in swarms. These little beetles lay their eggs in grain—oats, wheat, &c.—and the grubs from the eggs feed inside the grain. The adult beetles also feed on the grain. The beetles can breed even under dry conditions and may live and lay eggs for many months. Granary weevils may be destroyed by fumigating with bisulphide of carbon. Small lots of infested corn should be placed in an air-tight receptacle, and saucers containing the bisulphide should be placed *on the top*. The receptacle should then be closed for forty-eight hours, when the beetles and grubs will be found to be suffocated. If a granary is infested it should be made as air-tight as possible and submitted to the fumes of bisulphide of carbon for forty-eight hours, after which it should be well ventilated by windows and doors for an hour or two before entry. One to 2 lbs. of bisulphide of carbon would be sufficient to fumigate a hundred bushels of grain, and 1 lb. would fumigate 1,000 cubic feet of space.

The striped pea weevil (*Sitones lineatus*), which is described in Leaflet No. 19, has also been received from Bishop's Waltham. In one case where peas were so destroyed by this insect that they had to be sown three times over, the owner found that where fine soil was spread over the rows the peas were spared. The idea underlying this treatment is that the beetles shelter in coarse lumpy soil, and that the fine soil covering the rows deprived the beetles of shelter places.

Species of *Otiorhynchus* weevils (see Leaflet No. 2) were also found devouring maidenhair ferns in a greenhouse at Beckenham. In conservatories and greenhouses the following procedure has proved useful:—Well-tarred wooden boards should be placed on the ground under the plants at nightfall, and after it has become dark the plants should be shaken or their stems tapped; the feeding weevils fall on to the tarred boards and may then be destroyed. Another method is to place here and there among the attacked plants loosely twisted bands of hay. These are used by the beetles as shelter places, and may be removed in the morning and the sheltering beetles collected and destroyed.

Caterpillars on Vines.—The caterpillars of a moth (*Xylina rhinolitha*) common all over the country, were sent by one correspondent from Montrose, who stated that they were feeding on vines. To get rid of this pest the vines should be shaken, and the caterpillars, which fall off, collected and destroyed. Unless

the vinery is very extensive, hand-picking should be practised. If this method is impracticable owing to the extent of the area or the abundance of the caterpillars, the plants should be sprayed with a wash consisting of 1 oz. of Paris green in 12 gallons of water, the mixture being kept well stirred during the operation.

Lecanium Scale on Plum.—Some twigs from a plum-tree showed that it was infested with the *Lecanium* scale, against which a soft soap and paraffin emulsion should be used: 5 lb. of soft soap should be dissolved in boiling water, 1 gallon of paraffin added, and the whole emulsified by thorough churning. The quantity should be made up to 40 gallons, and the infested parts well brushed with the mixture, which will destroy the scale.

Tortrix Caterpillars on Apple and Pear Trees.—In two cases at New Barnet and Reigate, small Tortrix caterpillars were found to be infesting apple and pear-trees. The tortrix moths are included in the Microlepidoptera, and the caterpillars of at least six species have been found attacking both leaf and bud of pear and other trees. If the caterpillars are numerous the buds may be quite destroyed. Infested trees should be sprayed with Paris green (1 lb. of the paste in 250 gallons of water), which would kill such caterpillars as feed on the poisoned foliage.

"Honey Fall" on Fruit Trees.—One inquirer asks how the so-called "honey fall" on fruit trees may be removed. Reference is doubtless made to the sticky secretion which falls from the honey tubes of aphides and covers stem, leaf, and fruit in patches, providing at the same time an excellent nidus for the germination of numerous fungus spores. It may be cleared away by means of a solution of soft soap in hot water, 3 oz. of soft soap per gallon of water.

The bark of fruit trees, *e.g.*, the cherry, sometimes shows drops of gum trickling down it. The exact cause of this is still unknown, but Theobald mentions a case in which the gumming ceased on a slice (6 to 8 in. long and as deep as the cambium) being cut away from the tree on each side of the gumming area. This was done in July.

Fungus Gnats.—Small white elongated maggots were found in quantities in old leaf mould near Wick, and identified as the

larvæ of *Sciara*, a fly belonging to the family *Mycetophilidæ*, or fungus gnats. These larvæ are frequently found under damp bark or in decaying vegetable matter. It may be said that in general they are not harmful to vegetation, but in habit are really scavengers. One species, however, has proved harmful on mushrooms, and it has been necessary in some cases periodically to fumigate houses and cellars and to destroy the flies that swarmed on window panes or other places by spraying with paraffin emulsion.

Among other pests submitted for identification or advice as to the best method of prevention and remedy, may be mentioned :—(1) Caterpillars of the magpie moth (*Abraxas grossulariata*), an account of which will be found in Leaflet No. 20 ; (2) the millipede *Julus pulchellus*, described in Leaflet No. 94 ; (3) red spiders (see Leaflet No. 41) which were attacking gooseberries at Northwood and at several places in Herefordshire ; (4) currant aphides (see Leaflet No. 68) ; (5) wireworms attacking oats (Leaflet No. 10) ; (6) stem eelworm, fully described in Leaflet No. 46 ; and (7) raspberry moth caterpillar (*Lampronia rubiella*), which was doing serious damage near Belper (Leaflet No. 14).

Clover Mildew.—Some clover plants forwarded from Horsham, believed to be attacked by a fungous disease, were found to be suffering from clover mildew, caused by *Peronospora trifoliorum*, De Bary. Summer spores are formed throughout the season, these enabling the disease to spread with great rapidity. In the autumn, winter spores are produced on the dead leaves lying about, and these commence the disease the following season.

Ploughing before the winter spores are produced is the most certain remedy. After the spores are formed in the autumn ploughing is of no avail, as the buried spores retain their vitality for some years and are certain to come to the surface again sooner or later. The fungus is common on many leguminous weeds, and such should therefore be kept down.

Diseased Fruit Trees.—Several cases of fungous diseases of fruit trees have been brought to the notice of the Board. The minute fungus *Didymella applanata*, Sacc., was found infesting raspberry canes near Botley, the tissues being destroyed and the whole plant dying. The best remedial measure that can be

adopted against this disease is to cut out and burn all affected canes as soon as the disease is detected.

Gooseberries are sometimes attacked by the fungus *Puccinia Pringsheimiana*, Kleb., which causes red spots on the leaves. The fungus passes part of its life-cycle on the living leaves of different kinds of sedge. The spores produced on the sedges are scattered by the wind and infect the gooseberry leaves. On the first appearance of the spots the leaves should be sprayed with a solution of 2 oz. of potassium sulphide dissolved in 3 gallons of water. Cutting down sedges growing in the neighbourhood checks the disease, but the material cut down must be removed and burnt.

Another fungus, *Gloeosporium ribis*, Mont., was sent from Cornwall, where it was infesting gooseberry bushes. If applied sufficiently early in the spring very dilute Bordeaux mixture or potassium sulphide will check this disease.

Specimens of *Exoascus deformans*, peach leaf-curl (see Leaflet No. 120, and of *Sclerotinia fructigena*, brown rot of fruit (Leaflet No. 86), were also received from Minehead and Hailsham respectively.

A Pine Disease
(*Diplodia pinea.*)

Diseased shoots of pine have been sent to Kew for investigation on several occasions, and from widely separated districts during past years; but until March, 1906, no definite statement could be given as to the primary cause of the disease, owing to the unsuitable condition of the earlier specimens received. The reasons for this will be obvious, when the development of the fungus causing the injury is explained.

The disease is confined to terminal shoots, and is recognised by the yellowing and subsequent shedding of the leaves, followed by the death of the shoot, which dies back for a distance of 6 to 10 ins. These dead shoots are persistent, and, commencing with the year following infection, furnish a crop of fungus spores each season, which, in turn, infect other shoots.

Diplodia pinea, Kickx., the fungus causing the injury, is a wound parasite, that is, its spores on germination cannot enter through an unbroken surface into the living tissues

of its host-plant, but only through a wound made by some other agent. In every diseased shoot examined the presence of one or more slight wounds penetrating the cortex is indicated by a slight incrustation of resin surrounding the injured spot. It is through these injured points that the fungus gains an entrance into the living tissues. When once established, the mycelium extends rapidly towards the tip of the shoot, soon choking up the vessels and arresting the food supply intended for the growing point of the shoot. The mycelium of the fungus does not extend in the shoot for more than one or two inches below the point of infection, consequently the length of a dead shoot depends on the distance below the apex of the wound that enabled the fungus to enter.

Experiments conducted at Kew show that, within two months after infection, the leaves become yellow and begin to twist, the result of desiccation, and at the expiration of four months all the leaves have fallen, and the shoot is dead. In many other species of *Diplodia* fruit is not produced on the host-plant until the year following infection, and this condition of things appears to prevail in the fungus under consideration. The fruit condition is indicated by the presence of numerous blackish warts protruding through minute cracks in the dead bark.

Three-year-old plants of the following species, Weymouth pine (*Pinus Strobus*, L.), Scots pine (*Pinus sylvestris*, L.), Spruce (*Picea excelsa*, L.), Silver Fir (*Abies pectinata*, DC.) and Larch (*Larix europaea*, DC.) were infected as follows. Spores obtained from Dr. Somerville's material, and ascertained to be in a condition capable of vigorous germination when placed under favourable conditions, were used.

Spores placed on the unbroken surface of young shoots failed in every instance to infect the plant, whereas spores placed on the drop of moisture extending from a minute puncture in the bark invariably set up infection, which resulted in the formation of a dense growth of mycelium in the tissues, followed by a yellowing and falling of the leaves, as stated above.

Positive results were obtained in the case of the two species of *Pinus* named above. No infection occurred on species of *Picea*, *Abies* or *Larix*.

Although the fungus undoubtedly kills the twigs it infects, yet its entry depends on the presence of some previous wound, which, in all the specimens examined, was very small, and of the same general appearance, and, in all probability, caused by one particular kind of insect. It is important that this point should be settled.

In the case of nursery stock and young trees, the removal of all dead shoots would do much towards checking the spread of the disease, as the fungus is not known to occur on other kinds of trees.

New Zealand Flax (Phormium tenax).

Phormium tenax (New Zealand flax) is abundant throughout New Zealand and occurs also in Norfolk Island. It grows especially in lowland swamps and alluvial ground from sea-level to 4,000 ft., though some of the kinds, notably that known as the yellow hill-flax, affect localities that are not swampy or damp. If some of the native timber trees be excepted, this plant is economically the most important member of the New Zealand flora.

Phormium tenax in several different varieties grows quite well in Britain, in any locality influenced by the Gulf Stream, from south-west England and south-west Ireland as far north as the Orkney Islands. As a rule, however, the plant is only grown in gardens as a foliage plant, and, although occasional attempts to extract its fibre have been made in this country, these have rarely gone beyond the stage of experiment and have never been carried so far as the successful establishment of an industry.

In its native country *Phormium tenax* varies greatly in length of leaf, in the degree to which the leaf is curved and split at the top, in the general colour of the leaf, in the tint of a coloured line that borders the margin and midrib of the leaf, and in the colour of the flowers and the size of the capsule. As a rule the flower is reddish and the capsule is always three-cornered and straight. There is in New Zealand another species, *Phormium Cookianum*, of smaller size, with leaves of paler colour, with yellowish flowers, and with a longer, cylindrical and twisted capsule. This species is in other respects almost as variable as *Phormium*

tenax; like the latter, it is also well-known in several varieties in English gardens; none of the varieties of *Phormium Cookianum* appear to be of much, if of any, importance from the economic point of view, so that except in so far as it appears at times, in the absence of the flowers and fruits, to be difficult to distinguish between certain kinds of *Phormium Cookianum* and of *Phormium tenax*, *Phormium Cookianum* may be neglected. In New Zealand, and the same is true of this country, some of the varieties have the leaves variegated in a riband-like manner with white or creamy-yellow bands; others have a bronzy foliage. Such varieties are largely cultivated as ornamental foliage plants, but in New Zealand it is found that these varieties are not usually capable of being reproduced by seed, and if they are to be increased, must be propagated by root-cuttings.

In Britain, as has been explained, the attempts to extract fibre from *Phormium tenax* have been mainly tentative, and there has not been occasion for organised inquiry into *Phormium* from the economic point of view. Nor, if this had arisen, could such an inquiry have been entirely satisfactory until a preliminary collection of the various kinds had been made in the native country of the plant. Even in New Zealand, where the fibre of *Phormium* is regularly extracted and exported, such an investigation has never yet been completed. In the *Manual of the New Zealand Flora*, which was issued in 1906, it is stated (p. 716) that "no systematic attempt has been made to collect the whole of the varieties and cultivate them side by side." This work has, however, now been undertaken by the New Zealand Department of Agriculture, which has formed experimental plantations with the view of ascertaining the best varieties to grow.

If the experimental cultivation of *Phormium tenax* were to be undertaken in this country the following points should receive consideration:— 1) So far as is yet known, no variety of *Phormium* is likely to thrive luxuriantly except on the west coast; (2) hitherto *Phormium* has been grown in Britain only as a foliage plant and the attempts to extract its fibre have been casual; (3) *Phormium* appears to vary as greatly in regard to its fibre-producing qualities as it varies in regard to its qualities as an ornamental plant, and it seems certain that the variations in these two respects are in no way parallel; (4) in consequence

of this there are no means of determining which, or indeed of saying whether any, of the varieties grown as ornamental plants in this country belong to kinds that are known to yield the best quality of fibre ; (5) lastly, even if a locality were found in which one or other of the kinds known to yield the best quality of fibre would grow luxuriantly, it has to be recollected that the question is not merely one of growing the plant but of extracting the fibre from its leaves in a fashion that will be remunerative if worked on a commercial scale.

It would, therefore, be necessary that any attempts to grow *Phormium* should in the first instance be made on a small scale. It seems also essential that in the present state of our knowledge of the fibre-producing qualities of the varieties now grown as ornamental plants in this country, the experimental cultivation of *Phormium* for fibre should be rigidly confined to such kinds as have been proved in New Zealand to yield the best quality of fibre.

An article dealing with the cultivation, yield, and preparation of the fibre in New Zealand appeared in the *Bulletin of the Imperial Institute*, Vol. V., No. 1.

Notes as to Crop Prospects Abroad.

Russia.—The Board have received through the Foreign Office a translation of an article which appeared in the official "Commercial and Industrial Gazette," of May 12, relative to the condition, on the setting in of spring, of the winter grain sowings in the central zone of European Russia :—

"In all the governments of the south-western region, in some of the north-western, Polish, and Little-Russian governments, the condition of the winter sowings is in general unsatisfactory, in places very bad, more especially rye. In parts of the Polish, north-western and Little-Russian governments, in the governments of Kaluga and Orel, and in the northern parts of those of Tula and Riazan, forming part of the central agricultural region ; and in most districts of the Central Volga region, the winter sowings are in general saisfactory, *i.e.*, give promise of an average crop. In the remaining central agri-

cultural governments, and in the southern districts of the governments of Riazan, Tula and Saratoff the winter sowings are in good condition, in places very good, more especially the chief grain of these regions, winter rye."

H.M. Consul at Rostov-on-Don, writing on May 16, reports that the prospects for the new crops in the south-east of Russia are in general good. The area sown compares favourably with that of 1906.

India.—According to *Dornbusch* (May 31) the final official returns of the yield of wheat in India show the crop of 1906–07 to be 8,500,000 tons, as against 8,560,000 tons last year and 7,582,000 tons in 1904–05.

Germany.—The official report on the crops in the middle of May describes the condition of winter wheat as 3, of spring wheat as 2·5, winter rye 2·9, spring rye 2·4, barley 2·3, and oats 2·4 (1 = very good, 2 = good, 3 = medium, 4 = small and 5 = very small). In many districts the area under winter wheat, rye, spelt, clover and lucerne has had to be ploughed up, and for the whole of Germany it is estimated that 27·4 per cent. of the area sown with winter wheat has had to be thus dealt with. The average condition of winter wheat this year is reported as more unfavourable than at the same date in any year since 1901. The condition of the spring sowings was, however, generally favourable.

South-East Europe.—Unofficial reports on the wheat crops of Austria, Hungary, Bulgaria, Servia and Roumania are generally unfavourable.

United States.—According to the United States Department of Agriculture the area under winter wheat in cultivation on May 1 was about 28,132,000 acres, as compared with 31,665,000 acres sown in the autumn. This is about 1,468,000 acres less than the area harvested last year. The average condition of the crop was 82·9, compared with 89·9 on April 1, 1907, and with 90·9 on May 1, 1906, and 92·5 on May 1, 1905.

Report of the Land Division.

The Annual Report of the Assistant Secretary (Mr. R. H. Rew) in charge of the Land Division of the Board for the year 1906 has now been presented to Parliament. (Cd. 3504. Price, $2\frac{1}{2}d.$). It comprises the statutory reports required to be laid annually before Parliament by the Board, as the successors of the Tithe, Copyhold and Inclosure Commissioners, whose functions devolved in 1882 on the Land Commissioners, and were transferred to the Board of Agriculture on its formation in 1889.

The business arising under the various Acts administered in the Land Division is largely concerned with private or semi-private interests, which for various reasons have been placed by the Legislature in a greater or less degree under the supervision or control of the Department. Comparatively few of the large number of transactions passing through the Division in the course of the year possess more than a transitory interest, except to the individuals or localities immediately concerned, but the proceedings as a whole are of considerable importance to the community generally and to owners and occupiers of land in particular. The Acts thus administered are the Tithe Acts, the Copyhold Acts, Inclosure Acts, Agricultural Holdings Acts, Drainage and Improvement of Land Acts, Universities and Colleges Estates Acts, Glebe Lands Act, and certain other Acts.

Proceedings under the Diseases of Animals Acts.

The Annual Reports of the proceedings of the Board of Agriculture and Fisheries under the Diseases of Animals Acts, &c., during 1906 have now been presented to Parliament (Cd. 3415. Price 1*s.*). The Report of the Chief Veterinary Officer, Mr. Stewart Stockman, deals with certain technical points in connection with swine-fever, anthrax, and other diseases. Mr. Stockman states that during the year he has spent much time in the laboratory at Sudbury dealing with subjects under special investigation, which will form material for special reports. It was hoped that it would have been possible at an earlier date to have furnished a special report on the work done in connection with swine-fever, but this work

had to be abandoned temporarily owing to the pressing and immediate demands of the inquiry into epizootic abortion, which have to be almost exclusively attended to at the moment material is found available for further research. Enough has, however, been done to justify a report on swine-fever on the lines mentioned in his report for 1905, and an attempt will be made to present it as soon as possible.

A considerable amount of work in connection with the diagnosis in suspected outbreaks of anthrax, epizootic lymphangitis, sheep-scab, and rabies, had also been undertaken at the laboratory.

The Report of the Assistant Secretary, Mr. A. W. Anstruther, deals with the administrative measures taken under the Acts for the extirpation of the scheduled diseases. In explaining the operations undertaken in connection with the dipping of sheep, Mr. Anstruther observes that the universal compulsory dipping, which has been strongly advocated in many quarters, is about to become an accomplished fact. Special attention is drawn to the fact that periodical compulsory dipping, although a very valuable adjunct to other sanitary measures cannot properly be relied upon for the eradication of sheep-scab. It is to the thorough and careful administration of the Sheep-Scab Order of 1905 in the case of every reported outbreak that those concerned with the administration must look for the attainment of the object that they have in view. It is clear that in the dipping to order of a sheep-stock of over 25,000,000, failures to dip thoroughly must at first at any rate be of comparatively frequent occurrence. As years go by they will probably become more and more rare, but for the present it would be folly to place much dependence upon compulsory dipping as a substantial safeguard against sheep-scab. Danger lies in the possibility that some flockmasters may incline to place undue reliance upon the existence of the requirement of compulsory dipping, and in consequence may omit to take all the precautions they would otherwise insist upon when introducing fresh animals into their flocks. In proportion as this occurs the Compulsory Dipping Orders will have a positively detrimental effect upon the general operations against sheep-scab. Those interested will do well, therefore, to take note of this possible source of failure. It is further to be feared that some sheep-owners may be led by the

fact that they have recently dipped their sheep to overlook the earlier symptoms of the disease, which they had hoped by that process to have eliminated, and thus to fail to give prompt notice of the disease to the authorities.

The importance of the above cautions is enforced by the fact that as regards some parts of the districts in which compulsory dipping was enforced during 1906, the returns for the first quarter of the current year show a substantial increase in the prevalence of sheep-scab, notwithstanding the fact that there is no evidence that the compulsory dipping requirements were not in the letter complied with.

On the other hand sheep dipping is attended with beneficial results, apart altogether from the eradication of sheep-scab, of a character which renders its general adoption eminently desirable. It is also useful, where efficiently carried out, as a safeguard against the spread of disease. These considerations appear to justify its compulsory enforcement. There is also evidence to show that sheep-owners who have been obliged to take to the practice of periodic dipping, have in many cases already come to see the benefits which are derived therefrom, both as regards the improved quality of the wool-clip, and the general health of their flock, and individual sheep-owners have gone out of their way to testify to the Inspectors of the Board as to the good results that have been brought about in this connection.

In the case of swine-fever a very considerable rise in the total number of outbreaks occurred in 1906, there being 1,236 as compared with 463 in 1905. Although at first sight it would appear that such a recrudescence of swine-fever must militate seriously against the prospect of the eventual success of the measures adopted for its eradication, a closer examination of the question goes to show that such need not necessarily be the case. Had it been found that disease was on the increase throughout the country, and that the steps taken to control its spread had failed to effect their object, there might well be cause for disappointment amounting almost to despair. Such, however, is clearly not the case so far as last year's operations are concerned. Out of the 50 administrative counties into which England is divided 4 remained free from the disease throughout the years 1905 and 1906, and in 15 counties the return of outbreaks for 1906 was lower than in 1905, the improve-

ment in the position both in Kent and in Worcestershire being very marked. In two counties the figures were exactly equal in both those years, leaving 29 counties in which the outbreaks in 1906 exceeded those in 1905. In many of these the actual increase was slight, but in several it was very marked, predominantly so in Suffolk and in the East Riding of Yorkshire.

That the epidemics in the East and West Ridings of Yorkshire in the spring of the year, and in East Suffolk in the spring and again in the late autumn, have not, so far at any rate, been followed by a wide distribution of the disease is a matter for considerable satisfaction. The existence over the country generally of precautionary regulations affecting the movement of swine from district to district must, it is thought, be accepted as the main cause for this comparatively satisfactory state of affairs. Had the movement of swine out of Suffolk, for instance, been free and unfettered, it is hardly to be believed that disease would not have been scattered broadcast before its centres in that county had been fully detected. From Suffolk store swine are distributed to all parts of Great Britain, and it is not difficult to imagine what disastrous results in other districts might have followed therefrom had no safeguards been in existence.

In combating a disease like swine-fever Mr. Anstruther observes that it is probably inevitable that fluctuations should be experienced, and when one considers how easily the disease may be spread throughout a locality by the exposure of infected swine at a market, or by the introduction of the disease upon the premises of a pig-dealer, it would be unwise to lay too great stress upon the mere rise in the number of outbreaks recorded. The real test of the possibility of ultimate success lies in the success, or otherwise, of the measures adopted to control the disease, and to search out the disease centres. Judged by this test the results of the operations conducted during last year are not, it is submitted, entirely unsatisfactory. Provided that pig-owners and pig-dealers will consent to co-operate heartily with the authorities, there appear no good grounds for doubting that the ground lost will ultimately be regained.

The Report also contains information as to the work of the Division in relation to other matters, as well as statistical tables showing the prevalence of disease and the imports and exports of live stock.

Syllabus of Examination for Veterinary Inspectors of the Board.

In addition to the Chief Veterinary Officer and Assistant Veterinary Officer the Lords Commissioners of the Treasury have approved an established Veterinary Staff for the Board of Agriculture consisting of a Superintending Veterinary Inspector and ten Veterinary Inspectors over and above twelve Assistant Veterinary Inspectors not on the establishment. These officers devote their whole time to the work in connection with the scheduled contagious diseases of animals, and are not infrequently employed to inquire into other diseases of an apparently contagious nature, where the circumstances are of general importance to the agricultural community, and to which the Board's attention has been called by Agricultural Societies and stock-owners who have suffered serious loss.

Before appointment to the established staff, as vacancies occur, Veterinary Officers whose services on the non-established staff have been approved are required to have passed an examination held by the Civil Service Commissioners, the extent of which is embraced in the subjoined syllabus :—

Subjects of Examination.—

1. Pathology and Bacteriology.
2. The Diseases of Animals Acts, 1894 to 1903, and any Act amending the same : and the Orders of the Board of Agriculture and Fisheries thereunder.

In Subject 1 there will be a Practical as well as a Written Examination.

Candidates must pass to the satisfaction of the Civil Service Commissioners in both these subjects.

Syllabus of the Examination in Pathology and Bacteriology.

A. Written Examination.—

(1) General Pathology.—Inflammation. The Degenerations and Infiltrations. Neoplasms.

(2) Bacteriology.—Bacteriological Methods. Principles of Immunity and Vaccination Disinfection. The bacteria pathogenic for the domesticated animals, including the morbid anatomy and histology of the lesions which they produce, and the methods whereby certain diseases are communicated from animals to human beings.

(3) Protozoology.—General biology of the pathogenic protozoa. The Coccidioses, Trypanosomiases, Piroplasmoses, of the domesticated animals.

(4) Epizootiology.—The etiology, symptomatology, and differential diagnosis of the contagious diseases of animals.

B. Practical examination.—

Candidates will be tested with regard to their practical knowledge of bacteriological methods, and specially with regard to their ability to apply these in the diagnosis of the principal contagious diseases of the domesticated animals.

Importation of Pedigree Live Stock into Argentina.

The Board have received through the Foreign Office from H.M. Consul at Buenos Ayres a statement of the number of pedigree cattle, horses, sheep, and pigs imported into Argentina during the past three years.

	1904.	1905.	1906.
Cattle—			
Shorthorn	1,124	1,360	2,180
Hereford	20	56	93
Angus and Red Polled ...	40	23	143
Various	9	23	28
Total	1,193	1,462	2,444
Sheep—			
Lincoln	2,559	4,546	6,555
Rambouillet	92	37	41
Hampshire	145	260	412
Shropshire	232	243	299
Various	236	566	495
Total	3,264	5,652	7,802
Horses—			
Racehorses	30	195	302
Clydesdale	45	79	210
Hackney	42	49	100
Yorkshire	13	31	9
Percheron	22	84	256
Various	28	110	179
Total	180	548	1,056
Pigs	...	167	313

The increase in the number of horses is very striking. Of late the demand for heavy and medium draught horses has been very considerable, and the large increase in the imports of Clydesdales and Percherons is in response to this demand. It will be seen also that there was a marked increase in the number of Shorthorn cattle and Lincoln sheep.

Inspection of Meat in Canada.

The Board have received through the Colonial Office a copy of a despatch dated 18th March, 1907, from Earl Grey, Governor-General of Canada, stating that in consequence of the Chicago exposures in connection with the canned meat trade, His Majesty's Canadian Government realised the necessity, in order to preserve and extend Canadian trade, of passing and providing for the enforcement of such a law as would satisfy the consumer that he could accept, without suspicion, the Canadian produce as a sanitary, wholesome and cleanly article and true to the description on the label placed thereon. A Bill for this purpose was introduced into Parliament intituled "An Act respecting the inspection of meats and canned foods" and received the assent of the Governor-General on April 27th.

The Act in substance provides that every animal brought for slaughter to any establishment carrying on an export trade must, while alive, be inspected by an inspector appointed under the Act, who must be a duly qualified and skilled veterinarian. After slaughter the carcase must undergo another inspection by such an inspector. The carcase, or any part thereof, may then be removed from the establishment, or may be packed or canned therein, but in either case cannot go out for consumption as food without the stamp of the inspector. If any animal or carcase, or any part thereof, be found unhealthy or unfit for food, it must be condemned and disposed of under the direction of the inspector in such a way as to prevent it going into consumption as food.

While the Bill was aimed, primarily, at the preservation of the meat trade, its provisions have been extended, in a modified form, to canned fish, fruit and vegetables.

In every meat establishment there shall be one or more inspectors as may be required, who shall remain continually on the premises and exercise a close inspection of every product during the whole course of preparation for food, and who shall allow no produce to go out for consumption as food without the stamp of inspection. Owing to their great number this would be impracticable in the case of fish, fruit and vegetable establishments, but in their case such inspection as may be practicable will be made to prevent any unsound or unwhole-

some articles going into consumption as food, but the cans or other packages will not bear the stamp of inspection.

In all establishments, whether meat, fish, fruit or vegetable, a close supervision of sanitary conditions will be maintained. All packages will be required to bear the name and address of the packer and a true description of the contents, with the proviso, however, that in conformity with the established custom of trade in certain markets, fish products may be shipped without label.

To provide for the effective enforcement of the Act an adequate number of veterinarians are now being given, at the public expense, a special course of training in meat inspection, and will be ready to carry out the Act as soon as it comes into force.

The despatch goes on to state that a recent careful investigation by a competent officer of the Department of Agriculture established the fact that the conditions of the Canadian meat trade were highly satisfactory.

Number of Milk Tests made in 1906.

The arrangement made by the Board of Agriculture with various Agricultural Colleges and Institutions throughout the country whereby farmers are enabled to have their milk tested for the percentage of butter-fat at a fee of 6*d*. per sample was in operation during the whole of last year and it is, therefore, possible to see to what extent advantage was taken of the facilities offered. In the case of some institutions, the practice of milk testing has been in force for a longer period. From reports received from the various institutions, it appears that about 1,800 separate samples were sent in to be tested, a number which, considering that the system has only recently come into operation, may be regarded as not unsatisfactory.

There is, however, a very striking variation in the number of samples submitted in different districts which is no doubt partly due to the prevalence of dairying in the particular neighbourhood, but is also attributable to the fact that in some cases certain farmers have sent in a large number of samples for analysis in the course of the year. For instance, the Chelmsford County Technical Laboratories received as many as sixty-six

samples from one farmer in Hertfordshire, and a number of other farmers also submitted samples fortnightly or weekly. This regular testing is much to be encouraged. At some of the other centres also the average number of samples received from each person is sufficient to show that the advantage of systematic sampling is more or less recognised. The Glasgow and West of Scotland College received 187 samples from thirty-two persons or an average of nearly six each, while the Reading College received 201 samples from forty-four persons, and the Shepton Mallet Grammar School 111 samples from twenty-four persons, or between four and five samples each.

The number of samples tested at the different institutions is shown below :—

	Number of Persons Sending in Samples.	Number of Samples.
University College of North Wales, Bangor	12	36
University of Leeds	19	58
Armstrong College, Newcastle-on-Tyne	7	10
University College of Wales, Aberystwyth	1	1
Cambridge University	11	21
University College, Reading	44	201
South-Eastern Agricultural College, Wye	44	125
Midland Agricultural and Dairy College	43	116
Harper Adams Agricultural College	—	121
College of Agriculture and Horticulture, Holmes Chapel	75	117
Agricultural and Horticultural College, Uckfield... ...	13	48
Essex County Technical Laboratories	51	388
Lady Warwick's School, Bigods Hall, Essex	—	13
Eastern Counties Dairy Institute, Ipswich	—	92
Cumberland and Westmorland Farm School	9	16
County Council Dairy School, Gloucester	—	50
Shepton Mallet Grammar School	24	111
Glasgow and West of Scotland College	32	187
Mareschal College, Aberdeen	—	15
Edinburgh and East of Scotland College of Agriculture ...	—	70

Reference was made in the last number of this *Journal* (May, 1907, p. 89) to the importance of testing at certain specified intervals or at certain points in the lactation period for the purpose of ascertaining the average percentage of fat contained in the milk of individual cows, while for the purpose of checking the proportion of butter-fat in the mixed milk of a herd, it is obvious that testing at frequent intervals must be necessary. It is hoped that as the value of the system becomes more recognised, regular and systematic testing will be more

generally adopted, and will take the place of the occasional and sporadic sampling which has been a feature of many districts. A number of reports refer, in fact to the growing tendency among farmers to send in samples at periodic intervals, and state that the facilities afforded are much appreciated.

One analyst observes that the samples are generally sent in by large, well-to-do farmers, but otherwise there is not much to show how far the scheme has been taken advantage of by small cowkeepers.

In a number of cases the tests have shown the sample, whether taken from the milk of a single cow or from the mixed milk of a herd, to be below the 3 per cent. limit or deficient in respect of the solids not fat, provided by the Sale of Milk Regulations. In these cases the information afforded by the analysis should be of great value to the cowkeeper.

In the case of the milk from one cow which falls substantially below the 3 per cent. limit, the first step should be to ascertain whether this sample can be regarded as typical. For this purpose several samples of her morning and evening milk should be taken at intervals and submitted for analysis. If the cow is well fed and in good health, and the results are unsatisfactory, it is desirable that she should be removed from the herd and her place taken by a cow yielding milk with a higher percentage of fat.

In the case of mixed milk of a herd falling below the prescribed limits, the question of the hours of milking should be considered and a serious effort must be made to milk at hours which will allow a nearly equal interval between each milking. If this is done the mixed milk is very unlikely to fall below the 3 per cent. limit. If, however, a change in this respect is difficult, an attempt must be made to improve the herd by eliminating poor cows and introducing either better animals of the same breed or else Jerseys or Guernseys which can be relied upon to give a high proportion of butter-fat.

Generally speaking, if the animals are sufficiently fed, no alteration in the food is likely to have any permanent effect. It should be recollected that cows have a tendency to give the lowest proportion of butter-fat in the third month after calving.

Advice on any of these points can be obtained from the institutions making the tests.

Daily Forecasts of Weather during Harvest, 1907.

During the Harvest Season the Meteorological Office will, as before, supply forecasts of weather by telegraph to persons desirous of receiving them, upon payment of the cost of the telegrams. The forecasts will be so worded that the cost of each message will be 6*d*. for any one district, including an address of three words. If the address to which the forecasts are to be sent exceeds three words, an addition of a halfpenny for each additional word must be made to the cost of the daily telegram.

Applications for the forecasts should be sent to the Director, Meteorological Office, 63, Victoria Street, London, S.W., with a cheque or postal order to cover the cost of the telegrams for the period during which the forecasts are to be sent.

Notes on the Weather and the Crops in May.

The weather during the month of May has seemed ungenial and unfavourable, but judged by meteorological standards it was not unseasonable, and on the whole showed very few divergencies from the normal. The variations that occurred were not exclusively in any one direction The bad weather that characterised the concluding week of April was continued in the *first* week of May, the amount of warmth in every district of Great Britain being recorded as "deficient," while the rainfall was "heavy" ("very heavy" in Scotland W.) in every district except England N.E. The amount of sunshine was mostly normal, but night frosts occurred in most centres of observation, the temperature falling at Newton Rigg in Cumberland on one occcasion to 17° Fahr.

During the *second* week the weather improved, especially towards the end, and a short period of exceptional warmth was experienced. The sky was generally cloudy or overcast, but the warmth was "unusual" in every part of Great Britain except England E. and N.E., where it was "very unusual." Frosts were recorded at Cambridge, Dunmow and Clacton-on-Sea in the East, and at Birmingham, Kew and Southport. Sunshine in the western section of Great Britain was "scanty," in England S.W. "very scanty."

The brilliant weather with which the second week concluded was of very short duration, and entirely disappeared before the end of the *third* week. The mean temperature for the week differed little from the average as a whole, but from being very high at the beginning sank at the end of the week to an extremely low level. At Great Billing, Northampton, the thermometer registered 83·5° on Saturday the 11th and 84·3° on Sunday the 12th, and 80° in several places in England N.E. and E. and the Midlands, but by the end of the week a large anticyclone had been definitely established over the Icelandic regions and a brisk Northerly air current passed over this country, which caused the thermometer to fall to 32° in England N.W., 35° in England E., and 41° in the Channel Islands. Frosts were, however, rare. Rainfall was less than the average generally, except in England N.E. and E., where it was "heavy." During a thunderstorm at Southampton on the 13th, 1·12 in. of rain fell between 9.40 P.M. and 10.10 P.M.

During the *fourth* week the weather remained unsettled. Rain fell frequently in all districts and in most places in the Midlands and North East was sometimes heavy, while several places experienced heavy showers of hail. The rainfall for the week in England N.E. was "very heavy," as much as 1·25 in. falling in Lincoln on the night of the 23rd. The temperature, however, rose during the week, and by the end of the

week many of the minima were as high as the maxima of Sunday and Monday. Three frosts were recorded at Cambridge and Dunmow, the thermometer at the former place falling on one occasion to 24° Fahr.

The Meteorological Office issued with their weather report for the week ending Saturday, May 25th, the following note :—

"The low temperature prevailing at the commencement of the week under review has attracted much attention, particularly as it presented a striking contrast to the conditions which obtained earlier in the month, when the continuance for several days of a southerly wind over France and the British Isles, coupled with a large amount of sunshine, gave rise to temperatures above 80° at many stations in the eastern part of England.

"The distribution of pressure accompanying the cold weather was very typical of the conditions usually associated with the cold periods which so frequently occur about the middle of May. The most striking maps were those from Thursday, May 16th, to Sunday, May 19th. At the commencement of this period pressure was highest in Iceland and off the west coast of Europe, and lowest over Central Scandinavia. Thus there was a gradient for northerly wind over north-western Europe, and cold air flowed southward from the Arctic Region. On the morning of Friday, May 17th, the depression over Scandinavia had moved eastward, and a small subsidiary depression had developed over the Gulf of Genoa. The gradient for northerly wind now extended from the Arctic Region to the Mediterranean, and its intensity had increased somewhat. During Saturday and Sunday, May 18th and 19th, the general conditions remained unchanged over Great Britain and the Continent. The flow of air to the south was maintained unchecked, and gave rise to some very low temperatures. At most English and Scottish stations the maximum temperature on Sunday, May 19th, was but little, if at all, above 58°, and frost occurred at night in many places. On the Continent conditions were equally unfavourable. Even on the shores of the Mediterranean the cold was severe for the time of the year ; at Nice the thermometer did not rise above 54° on May 19th. On the same day the maximum reading was 46° at places as far apart as Belfort and Prague, and only 41° at Munich.

"Under the influence of northerly or north-easterly winds and in the absence of much sunshine, temperature remained low generally in the British Isles during the early part of the week, and the week's warmth was "deficient" in all districts and "very deficient" in some. The mean temperature of the air in our two northernmost districts was about one degree below the mean temperature of the sea off the north of Scotland, as recorded at Lerwick, Kirkwall and Wick. Further to the south, the difference between the mean temperature of the air and that of the water at the coast stations was considerably greater, amounting in some cases to nearly 5°."

The reports from the Board's correspondents show that the effect of the cold weather has not been serious. In Berkshire it is said that though the frost on the 19th cut down early potatoes in a few places, the fruit does not seem damaged, while vegetation has made great progress. In Kent it is reported that the sharp frost on that day seems to have done little harm, except to potatoes. Clover and hay look as if the crops would be heavy. A similar good report comes from Wisbech, Cambridge, where, however, it is stated that things are backward. Frost is said to have injured the fruit crop a little. Insect pests are said to be abundant, in spite of extensive spraying. Much more observation is needed on the effects of the weather on the prevalence of insect pests. The Board would be glad to receive reports based on careful observation during the months of June and July. In Lincolnshire, meadows and pastures which at the beginning of the month were in a backward condition were greatly benefited by the thunder rains in the second week. The cold weather about Whitsuntide, however, prevented vegetation making any rapid growth. Night frosts cut down potatoes in low-lying gardens. From Argyllshire it is reported that potatoes began to show through the ground in the last days of the month. Turnips were nearly all sown. The oat crop brairding fairly, but like grass has not the growth it should have, owing to lack of warmth, in consequence of which everything is backward. Lambings all over. The number of yeld ewes is above the average.

Miscellaneous Notes.

National Poultry Organisation Society.—With reference to the note in last month's *Journal* on the subject of the National Poultry Organisation Society, the *Journal* of that Society (May, 1907) gives some particulars of several of the collecting depôts which are of interest as showing the extent of the trade which has been developed even in the few years during which they have been established. The Framlingham and District Agricultural Co-operative Society, which deals in agricultural produce generally, has made a special feature of the egg business, and the number of eggs sold has increased from 453,000 in 1904, to 623,000 in 1905, and again to 845,000 in 1906. It is anticipated that the "million" will be reached during the present year. The members received a better price for eggs in 1906 than in any previous year. The Street Collecting Depôt sold 337,000 eggs at an average price of 1*s.* 1¼*d.* per dozen, the South Wilts Depôt marketed 266,000 eggs, the Fairford Depôt 161,000 eggs, the Wickham Market Depôt 155,000 eggs, and several other depôts sold quantities under 100,000.

Sparrow Clubs.—In connection with the reduction in the number of sparrows by means of the action of sparrow clubs, the Board have been furnished by Mr. J. P. Phillips with an interesting account of a local effort at Spetchley, Worcester. In this case the work is not done by a sparrow club in the strict sense of the term, but by a branch of a small committee formed to manage the technical classes under the County Council, and is financed almost entirely by a large landowner of the district. Heads or eggs of house sparrows are purchased from persons living or working in specified districts, and paid for at the rate of 3*d.* per dozen for heads of adult birds, and 1½*d.* per dozen for nestlings or eggs. Only house sparrows are paid for, and the hope is expressed that in netting and shooting care will be taken to spare harmless and useful birds. A prize system was tried one winter, but it was not found to be a success, only four men competing, while many who had brought a few dozen birds and eggs under the purchase system did nothing. This method was, therefore, abandoned. Since January 1905, the results on the per head plan have been as follows:—

January to September, 1905—heads, nestlings and eggs ...	1,420
September, 1905 to March, 1906—heads	1,010
March to September, 1906—heads	376
,, ,, ,, nestlings and eggs	738
September, 1906 to March, 1907—heads ... (about)	700
Total	4,244

Mr. Phillips states that there has been a noticeable decrease in the numbers of sparrows in some parts of the district, and the bird-catchers complain of the increasing difficulty of getting value for the time spent. At the same time an increase in the number of swallows and other birds has been observed.

Buttercups in pastures.—The Consulting Botanist to the Royal Agricultural Society in his Annual Report for 1906 refers to the presence of buttercups in pastures. All the species of Ranunculus, called buttercups or spear-worts, possess acrid properties and have not the slightest feeding value. They are usually rejected by animals, but young stock not unfrequently eat them to their injury. Some farmers like to see buttercups in a field. They consider them to be the sign of a good pasture. Buttercups no doubt show that the soil is fitted to grow plants, but every buttercup is a distinct injury to the pasture. Being rejected by the stock they flower and seed in abundance. Their numerous seeds are well protected and remain ready to germinate under favourable conditions. Some of the more acrid increase by creeping stems that run above the ground or in the soil. The pasture becomes more and more filled with yellow buttercup, and it loses half its value by the presence of acrid plants which cause every year injury to, if not the death of, some animals.

Destruction of Mice and Voles.—Both mice and voles are sometimes very destructive to young trees. The Long-tailed Field Mouse, *Mus sylvaticus,* works chiefly at the roots and for a few inches above the surface of the ground. The voles—other than

the water rat or water vole—gnaw not only near the ground but being good climbers may damage the trees higher up. *Evotomys glareolus* is an especially good climber. The water vole, *Arvicola* or *Microtus amphibius*, lives below ground, and gnaws roots, etc. Both fruit and forest trees are attacked by these small rodents, and among forest trees the willow, ash, beech, oak, and hornbeam are gnawed. Apart from the ordinary modes of trapping, and the encouragement of predaceous birds and small mammals, the following methods of extermination may be tried as conditions permit: (1) the herding of swine in the infested area: the swine grub up the mice and destroy their runs; (2) the grazing of cattle to keep down the undergrowth and so prevent shelter and destroy breeding places; (3) several times in bad infestations in England and Scotland much good has resulted from digging trenches 30 yards apart, 18 to 20 inches broad at the bottom, 9 inches broad at the top, 1½ feet deep, and 2 feet long: mice and voles falling in were unable to climb the inward-sloping sides and so were trapped. In the Forest of Dean 30,000 field-voles were caught by this means. Further information on the subject of voles will be found in the Board's Leaflet, No. 6 (*Voles and their Enemies*).

Weeds.—Among weeds, cow parsley (*Anthriscus sylvestris*) is occasionally a source of trouble. The growth of this weed is greatly promoted by nitrate of soda, and the use of this manure should be avoided where cow parsley occurs. Superphosphate and kainit, on the other hand, by promoting the growth of clover and grass might help to choke out the cow parsley. Two to three hundredweight of each might be applied per acre. Care should be taken not to allow the weed to seed, and hay should be cut early.

Meadow saffron (*Colchicum autumnale*), which is mentioned in the Board's Leaflet No. 112, is poisonous in all its parts. "As the plant is injurious to most animals and man, it should be destroyed in fields, for cattle will sometimes crop the leaves in the spring." (English Botany, Vol. ix., p. 225).

Danish System of Taxation.—The British Vice-Consul at Copenhagen, Mr. C. H. Funch, M.V.O., has prepared a report (Foreign Office, Miscellaneous Series, No 659) on the revised system of taxation introduced into Denmark in 1903, together with a brief account of the taxation prior to that year. This revised system is embodied in four separate laws, which have for their main object the relief of the agricultural class from what was thought to be excessive taxation, as compared with taxation borne by other classes of the community. The accomplishment of this object is seen from the fact that although the total returns from the State taxes for 1904 increased by 26 per cent., the burden of the rural districts was lessened by 8 per cent.

The Potash Deposits of Germany.—Some information as to production of potash in Germany was given in the last volume of this *Journal* (July, 1906, p. 221), and reference was made to the participation of the Prussian Government in the central organisation known as the Potash Syndicate. According to the Foreign Office Report (Annual Series No. 3796) on the Trade of Germany, it appears that the State has recently greatly extended its sphere of influence by acquiring the Syndicate mine "Hercynia" for the sum of £150,000.

The sales of potash salts in 1906 amounted to over half-a-million tons, and showed a considerable increase compared with 1905. Two years ago the price of potassium salts was reduced, but at the close of 1906 it was raised to the standard obtaining in 1904. This advance, which applies to all European countries except Germany, is equivalent to an increase per 10 tons (of 2,204 lb.) of £2 for France, the Netherlands, Belgium, Scotland and Ireland, and of £1 10*s*. for England.

Mr. Consul-General Schwabach, in the Report above referred to, observes that the future of the German potash industry will depend mainly upon the ability of the syndicate to prevent over-production, in spite of the strenuous activity displayed in establishing new concerns. Of the total of 36 mines belonging to the syndicate, no less than 31 companies are at present occupied in sinking new shafts.

SELECTED CONTENTS OF CURRENT PERIODICALS.

Bulletin of the Royal Botanic Gardens, Kew. No. 5, 1907.
Mud-Binding Grasses.

Journal of the British Dairy Farmers' Association. Vol. XXI.
Dairy Hygiene, *F. Orford L. Walpole;* Some Milk Problems, *James Sadler;* The Shropshire Dairy Conference, including Papers on "The Improvement of the Cow," *Primrose McConnell*, and "Small Holdings for Dairy Purposes," *Miss L. Jebb.*

Journal of the National Poultry Organisation Society. Vol. I., No. 2.
The Management of an Egg Collecting Depôt, *W. Reynolds:* The Production of Milk Chickens.

Journal of Agricultural Science. Vol. II., Part 2.
Studies in the inheritance of disease-resistance, *R. H. Biffen;* Notes on the Infection and Histology of two wheats immune to the attacks of *Puccinia glumarum*, yellow rust, *Dorothea C. E. Marryat;* The Chemistry of strength of wheat flour, *T. B. Wood:* Soils of Cambridgeshire, *F. W. Foreman:* The Hybridisation of Barleys, *R. H. Biffen;* Losses in making and storing farmyard manure, *T. B. Wood;* Note on Mendelian heredity in cotton, *W. Lawrence Balls.*

Journal of the Department of Agriculture for Ireland. Vol. VII., No. 3.
Field Experiments, 1906, Barley; Standard Butter Packages; Cultivation of Main Crop Potatoes; Marketing of Irish Eggs, Poultry and Fruit in 1906.

Bulletin de l'Agriculture (Brussels) XXII. 7.
Contribution à l'étude des conditions de température et d'humidité dans la détermination du pouvoir germinatif de quelques graminées agricoles, *C. Deneumostier.*

Ibid. XXIII. 4.
Le Cheval belge en Allemagne, *M. Leyder.*

Mitteilungen der Deutschen Landwirtschafts Gesellschaft. 22 Jahrgang.
Stück 13. Versuche mit Kaltstickstoff, Chilesalpeter und schwefelsaurem Ammoniak, *Dr. E. Wein;* Neures über die Nitrifikation und ihre Bedeutung, *Dr. Ehrenberg.*

Stück 14. Versuche über den Verbleib des Gründüngungs-stickstoffs auf einem leichten Sandboden, *Dr von Seelhorst.*

Stück 16.—Anbau von späten Rotklee in Schweden; Die affiltanze collettive, eine neue Form der Landwirtschaftlichen Produktivgenossenschaft in Italien.

Stück 17.—Die Entwicklung des Futterrübenbaues in der danischen Landwirtschaft, *Dr. Hollman.*

Stück 18 und 19.—Untersuchungen über die Zusammen-setzung und düngende Wirkung der Wasserfäkalien aus der Stadt Posen, *Dr. Gerlach.*

Stück 20.—Das sog. Gesetz vom abnehmenden Bodenertrag, *Dr. Waterstradt.*

Fühlings Landwirtschaftliche Zeitung. 56 Jahrgang.
9 Heft.—Die Impfungsfrage in der Bodenbakteriologie, *Dr. Paul Ehrenberg;* Stranderbse, *Pisum maritimum, C. Becker.*

9 & 10 Heft.—Deutschlands Zuckerrübenbau, *Dr. M. Augstin.*

10 Heft.—Die Impfung von Leguminosensamen nach dem Verfahren von Hiltner und Moore, *Max Eickemener.*

Naturwissenschaftliche Zeitschrift für Land- und Forstwirtschaft. 5 Jahrgang, Heft 5.
Über die Einwirkung des Kaltes auf Buchenrohhumus (Trockentorf), *P. E. Miller* und *Fr. Weis;* Über Seegras, seine Nutzung und seine Ansprüche an den Nährstoffvorrat des Bodens, *Dr. Rebel* und *Dr. B. Gotzner.*

Jahrbuch des Deutschen Landwirtschafts-Gesellschaft. Band 22. Lieferung I.
Das Blühen des Getreides, *Prof. Fruwirth;* Brandkrankheiten des Getreides, *Dr. Brefeld:* Ratten-, Mäuse- und Schneckenbekämpfung, *Dr. Raebiger;* Vogelschutz, *Hans Freiherr v. Berlepsch.*

ADDITIONS TO THE LIBRARY.

Australasia—

New Zealand.—Department of Agriculture, Divisions of Biology and Horticulture, and Publications. Report, 1906 (462 pp.). Agriculture in New Zealand. (20 pp.) Chemistry Division, Report, 1906 (22 pp.) Wellington: Jno. Mackay, 1906.

Queensland.—Department of Agriculture, Bureau of Sugar Experiment Stations. Report, 1906 (37 pp.)

British New Guinea.—Annual Report for 1905–06 (93 pp.)

Belgium—

Collection Zoologiques du Baron Edm. de Selys Longchamps. Catalogue Systématique et Descriptif. Fasc. XVII. Cordulines (94 pp. + 3 coloured plates). Brussels: Hayez, 1906. [The parts of this work as issued will be added to the Library.]

Canada—

Report of the Select Standing Committee on Agriculture and Colonization, 1906. (548 pp.) Ottawa: S. E. Dawson.

British Columbia.—Department of Agriculture:—

Bull. 12. Information for Fruit Growers. 3rd Edition. (31 pp.) 1905.

Bull. 14. Care and Management of Orchards. 2nd Edition. (24 pp.) 1905.

Bull. 19. Poultry Raising in British Columbia. (40 pp.) 1906.

Bull. 20. Varieties of Fruit recommended. (8 pp.) 1906. Victoria, B.C.

Prince Edward Island.—Department of Agriculture. Report for nine months ended 30 Sept., 1906. (68 + 28 pp.) Charlottetown: Murley & Garnhum.

Nova Scotia.—Secretary for Agriculture. Report, 1906 (223 pp.) Halifax, 1907.

Denmark—

Boas, J. E. V.—Skadelige Insekter i vore Haver. (72 pp.) Copenhagen: C. J. Catos, 1906. 50 øre.

France—

Alquier, M. J.—Les Aliments de l'Homme (1er Congrès International d'Hygiène Alimentaire). Paris: Masson et Cie. 1906.

Duchemin, R.—La Dénaturation de l'Alcool en France et dans les principaux pays d'Europe. (264 pp.) Paris: H. Dunod et E. Pinat, 1907.

Hubert, P.—Le Bananier (222 pp.) Paris: Dunod et Pinat, 1907.

Germany—

Deutsche Landwirtschafts-Gesellschaft.—Arbeiten. Heft 125.—Die Hafer-Unbauversuche der D. L. G. (51 pp.) Berlin: Paul Parey, 1907. 1 m.

Jahrbuch der Deutschen Landwirtschafts-Gesellschaft. Band 22. Lieferung. 1. (242 pp.) Berlin: D. L. G., 1907.

Great Britain—

The Cambridge Natural History, edited by S. F. Harmer and A. E. Shipley. Vol. V. Peripatus: Myriapods: Insects, Part I. Vol. VI. Insects, Part II. Vol. VII. Hemichordata: Ascidians and Amphioxus: Fishes. Vol. IX. Birds. London: Macmillan, 1901 to 1904.

Church's Laboratory Guide. Revised by Edward Kinch, F.I.C. Eighth Edition (349 pp.) London: Gurney and Jackson, 1906.

Slater, Gilbert. The English Peasantry and the Enlosure of Common Fields. (337 pp.) London: Constable, 1907. 10s. 6d. net.

The Country Gentleman's Estate Book, 1907. (567 pp.) London: Country Gentleman's Association, 1907.

Departmental Committee on Compensation for Industrial Diseases.—Report and Minutes of Evidence [Cd. 3495 and 3496]. London: Wymans. 3d. and 4s.

Green, F. E.—How I Work my Small Farm. (92 pp.) London: A. C. Fifield. 1s.

Wolff, H. W.—Co-operative Banks for Agriculture. (16 pp.) London: Agricultural Organisation Society, 1907.

Great Britain—*continued.*

British Dairy Farmers' Association.—Journal, Vol. XXI. (205 pp.) London: British Dairy Farmers' Association, 1907. Price to Non-Members 1s.

Armstrong College, Manuring of Potatoes and Swedes, Report, 1906. (12 pp.) Newcastle-upon-Tyne, 1907.

Collinge, W. E.—Some Insects injurious to Barley and other Grain when in store. (22 pp.) [Reprinted from the Journal of the Institute of Brewing.] 1907.

Congested Districts Board for Scotland.—Report, 1906–7. [Cd. 3471]. (26 pp.) London: Wymans, 1907. 5½d.

India—

The Agricultural Ledger, 1906. No. 7. Notes on Agave and Furcræa in India. (271 pp.) Calcutta: Government Printing Office. 1907. 4d.

Ceylon.—Administration Reports, 1905. 2 vols. (approx. 500 + 650 pp.) Colombo: Cottle, 1906.

Department of Agriculture in India.—Memoirs:—

Botanical Series. Vol. I., No. 5. An Account of the Genus Pythium and some Chytridiaceæ (160 pp. + x plates). Rs. 4·8.

Chemical Series. Vol. I., No. 2. The Composition of the Oil-seeds of India. (38 pp.) Re. 1. Calcutta: Thacker, Spink & Co.

Straits Settlements.—Report on Botanic Gardens, 1906. (13 pp.) Singapore, 1907.

Bengal.—Department of Agriculture. Report for 15 months from 1st April, 1905 to 30th June, 1906. (31 pp.) Agricultural Statistics for 1905–6. (48 pp.) Calcutta: The Bengal Secretariat Book Depôt, 1906. 9d. each.

Central Provinces.—Revenue Administration, Report, 1905–6. (78 pp.) Nagpur: Secretariat Press, 1907. 1s. 6d.

North-West Frontier Province.—Report on Land Revenue, Land Records and Agriculture, &c., 1905–6. (82 pp.) Peshawar: Government Press, 1907. 3s.

Ireland—

Irish Agricultural Organisation Society, Ltd. Report, 1905–6. (136 pp.) Dublin: Sealy, Bryers & Walker, 1906. 1s.

Italy—

La R. Scuola Superiore di Agricoltura in Portici nel passato e nel presente, 1872–1906. (331 pp.)

Switzerland—

Barde, A.—L'Électroculture. (18 pp.) Geneva: W. Kündig & Fils. 1906.

United States—

Vye, J. A.—Farm Accounts. (141 pp.) Published by the Author, St. Anthony Park, St. Paul, Minn. 1906. $1·25.

Hume, H. H.—Citrus Fruits and their Culture. (597 pp.) Jacksonville, Florida: Drew, 1904.

Powell, E. C.—Barn Plans and Outbuildings. New Edition. (388 pp.) 1906. New York: Orange Judd Company.

Kains, M. C.—Ginseng. (144 pp.) 1906. *Falconer, W.*—Mushrooms. (169 pp.) 1906. *Allen, C. L.*—Cabbage, Cauliflower and allied Vegetables. (125 pp.) 1906. *Morse, J. E.*—The New Rhubarb Culture. (130 pp.) 1906. *Hexamer, F. M.*—Asparagus. (168 pp.) 1906. *Greiner, T.*—The New Onion Culture. (114 pp.) 1906. *Sevey, C. G.*—Bean Culture. (130 pp.) 1907. *Beattie, W. R.*—Celery Culture. (143 pp.) 1907. *Tracy, W. W.*—Tomato Culture. (150 pp.) 1907. New York: Orange Judd Company.

Weed, C. M.—Spraying Crops. (136 pp.) 1906; Fungi and Fungicides. (228 pp.) 1896; Insects and Insecticides (334 pp.) 1906. *Johnson, W. G.*—Fumigation Methods. (309 pp.) 1907. New York: Orange Judd Company.

Kansas.—State Board of Agriculture. Biennial Report for 1905 and 1906. (1263 + 73 pp.) Topeka: Department of Agriculture, 1907.

[Books may be borrowed from the Board's Library on certain conditions, which may be ascertained on application.]

PRICES OF AGRICULTURAL PRODUCE.

AVERAGE PRICES of LIVE STOCK in ENGLAND and SCOTLAND in the Month of May, 1907.

(Compiled from Reports received from the Board's Market Reporters.)

Description.	ENGLAND.		SCOTLAND.	
	First Quality.	Second Quality.	First Quality.	Second Quality.
FAT STOCK :—	per stone.*	per stone.*	per cwt.†	per cwt.†
Cattle :—	s. d.	s. d.	s. d.	s. d.
Polled Scots	8 1	7 10	37 8	34 5
Herefords	8 1	7 7	—	—
Shorthorns	7 10	7 3	37 0	34 0
Devons	8 2	7 5	—	—
	per lb.*	per lb.*	per lb.*	per lb.*
	d.	d.	d.	d.
Veal Calves	8½	7¾	8½	6¾
Sheep :—				
Downs	9	8¼	—	—
Longwools	8¼	7¾	—	—
Cheviots	9¼	8¾	10	8¾
Blackfaced	8½	—	9¾	8½
Cross-breds	8¾	8	10¼	9
	per stone.*	per stone.*	per stone.*	per stone.*
Pigs :—	s. d.	s. d.	s. d.	s. d.
Bacon Pigs	6 9	6 4	6 4	5 5
Porkers	7 2	6 9	6 9	6 0
LEAN STOCK :—	per head.	per head.	per head.	per head.
Milking Cows :—	£ s.	£ s.	£ s.	£ s.
Shorthorns—In Milk	20 18	17 14	23 2	17 12
,, —Calvers	20 16	17 17	19 18	17 0
Other Breeds—In Milk ..	18 2	14 13	17 17	15 6
,, —Calvers ...	—	—	18 2	15 3
Calves for Rearing	2 3	1 15	2 9	1 15
Store Cattle :—				
Shorthorns—Yearlings ...	9 16	8 8	10 3	8 1
,, —Two-year-olds ...	14 7	12 7	14 13	12 7
,, —Three-year-olds	17 3	15 12	16 7	14 5
Polled Scots—Two-year-olds	—	—	16 1	13 12
Herefords— ,,	14 14	13 8	—	—
Devons— ,,	14 8	12 15	—	—
Store Sheep :—	s. d.	s. d.	s. d.	s. d.
Hoggs, Hoggets, Tegs, and Lambs—				
Downs or Longwools ...	52 2	47 6	—	—
Scotch Cross-breds... ...	—	—	42 4	36 6
Store Pigs :—				
Under 4 months	29 10	22 5	23 7	18 8

* Estimated carcase weight.

† Live weight.

AVERAGE PRICES of DEAD MEAT at certain MARKETS in ENGLAND and SCOTLAND in the Month of May, 1907.

(*Compiled from Reports received from the Board's Market Reporters.*)

Description.	Quality.	London.	Birmingham.	Manchester.	Liverpool.	Glasgow.	Edinburgh.
		per cwt. s. d.	per cwt. s. d.	per cwt. s. d.	per cwt. s. d.	per cwt. s. d.	per cwt. s. d.
BEEF :—							
English	1st	52 0	52 6	53 6	—	55 6*	54 6*
	2nd	50 6	48 0	48 6	—	54 6*	49 0*
Cow and Bull ...	1st	—	45 6	44 0	40 0	45 6	45 0
	2nd	—	40 6	38 6	36 6	40 0	39 6
U.S.A. and Canadian :—							
Port Killed ...	1st	52 6	51 0	51 0	51 0	52 0	—
	2nd	49 0	46 6	47 0	46 6	50 0	—
Argentine Frozen—							
Hind Quarters ...	1st	34 0	34 6	33 6	33 0	35 6	34 6
Fore ,, ...	1st	29 6	30 6	30 0	29 0	30 6	30 6
Argentine Chilled—							
Hind Quarters ...	1st	42 0	42 6	41 6	41 0	—	43 0
Fore ,, ...	1st	30 6	32 0	30 6	31 6	—	32 6
American Chilled—							
Hind Quarters ...	1st	55 0	53 0	52 0	52 0	54 6	54 6
Fore ,, ...	1st	36 0	35 0	34 6	34 6	36 6	37 0
VEAL :—							
British	1st	68 6	66 0	73 6	77 0	—	—
	2nd	62 6	50 6	65 6	69 0	—	—
Foreign	1st	69 6	—	—	—	—	60 0
MUTTON :—							
Scotch	1st	80 6	—	82 0	81 0	79 0	79 6
	2nd	73 6	—	77 6	75 6	73 6	68 6
English	1st	74 0	71 6	77 0	73 6	—	—
	2nd	66 6	59 6	70 0	69 0	—	—
U.S.A. and Canadian—							
Port killed ...	1st	—	—	71 0	—	70 0	—
Argentine Frozen ...	1st	32 6	35 0	35 0	35 0	35 0	36 0
Australian ,, ...	1st	32 6	34 6	32 6	32 6	35 0	—
New Zealand ,, ...	1st	40 6	38 0	42 0	42 0	35 0	—
LAMB :—							
British	1st	101 6	96 0	98 0	99 6	98 0	97 0
	2nd	91 6	86 6	92 6	92 6	88 6	84 0
New Zealand ...	1st	53 6	54 0	52 6	52 0	55 6	55 0
Australian	1st	46 0	46 0	44 0	44 0	46 0	43 0
Argentine	1st	45 0	46 6	45 6	45 6	46 0	—
PORK :—							
British	1st	58 0	63 0	59 0	56 6	57 0	53 0
	2nd	52 0	56 0	55 6	54 0	55 0	46 6
Foreign	1st	55 6	60 0	60 0	60 0	—	—

* Scotch.

AVERAGE PRICES of **British Corn** per Quarter of 8 Imperial Bushels, computed from the Returns received under the Corn Returns Act, 1882, in each Week in 1905, 1906 and 1907.

Weeks ended (*in* 1907).	Wheat.			Barley.			Oats.		
	1905.	1906.	1907.	1905.	1906.	1907.	1905.	1906.	1907.
	s. d.	*s. d.*	*s. d.*	*s. d.*	*s. d.*	*s. d.*	*s. d.*	*s. d.*	*s. d.*
Jan. 5 ...	30 4	28 4	26 0	24 4	24 6	23 11	16 3	18 2	17 3
,, 12 ...	30 4	28 6	26 1	24 6	24 8	24 2	16 3	18 4	17 4
,, 19 ...	30 5	28 5	26 1	25 0	24 11	24 1	16 5	18 4	17 5
,, 26 ...	30 6	28 7	26 2	25 1	25 1	24 5	16 7	18 7	17 5
Feb. 2 ...	30 6	28 10	26 3	25 0	25 1	24 4	16 7	18 10	17 5
,, 9 ...	30 7	28 10	26 6	25 2	25 3	24 5	16 8	18 10	17 7
,, 16 ...	30 5	28 11	26 7	25 2	25 6	24 1	16 9	19 0	17 7
,, 23 ...	30 10	28 10	26 10	25 0	25 4	24 2	16 10	19 0	17 9
Mar. 2 ...	30 8	28 8	26 9	25 2	25 0	24 2	16 10	19 0	17 9
,, 9 ...	30 9	28 5	26 8	25 2	25 1	23 11	16 10	18 8	17 11
,, 16 ...	30 10	28 5	26 10	24 11	24 8	24 2	16 10	18 10	18 0
,, 23 ...	30 9	28 4	26 10	25 2	24 4	24 0	17 0	18 8	18 1
,, 30 ...	30 9	28 3	26 8	25 1	24 5	23 9	16 11	18 11	18 2
Apl. 6 ...	30 9	28 7	26 9	25 6	24 2	24 3	17 0	18 11	18 3
,, 13 ...	30 8	28 11	26 8	24 3	24 4	23 9	17 6	19 4	18 6
,, 20 ...	30 8	29 4	26 8	24 4	24 0	23 3	17 5	19 1	18 7
,, 27 ...	30 9	29 6	26 10	24 4	24 0	23 3	17 9	19 6	18 9
May 4 ...	30 8	29 10	27 0	25 3	23 10	23 6	18 0	19 9	19 3
,, 11 ...	30 8	30 1	27 6	24 10	24 1	24 0	18 3	20 0	19 7
,, 18 ...	30 10	30 3	28 4	24 8	23 10	23 10	18 5	20 1	20 1
,, 25 ...	30 11	30 4	29 7	24 4	24 2	24 3	18 8	20 2	20 5
June 1 ...	31 3	30 4	31 4	23 6	22 10	24 0	19 1	20 5	20 8
,, 8 ...	31 4	30 3	32 0	24 0	23 4	24 7	18 11	19 11	20 7
,, 15 ...	31 7	30 4		26 0	23 6		19 1	20 2	
,, 22 ...	31 7	30 5		23 9	22 10		18 10	20 2	
,, 29 ...	31 8	30 3		23 2	24 3		19 7	20 1	
July 6 ...	32 1	30 2		22 11	23 0		19 6	20 2	
,, 13 ...	32 3	30 5		23 10	23 8		19 7	20 4	
,, 20 ...	32 2	30 3		23 7	23 2		18 11	20 5	
,, 27 ...	32 3	30 5		23 11	22 4		19 3	20 2	
Aug. 3 ...	31 11	30 9		22 0	22 1		18 4	19 3	
,, 10 ...	30 5	30 5		22 5	23 0		16 11	17 11	
,, 17 ...	28 5	29 0		23 4	24 2		16 4	17 0	
,, 24 ...	27 1	27 9		23 6	25 0		15 9	16 10	
,, 31 ...	26 11	26 9		23 5	24 3		15 9	16 6	
Sept. 7 ...	27 1	26 4		23 4	24 9		15 11	16 3	
,, 14 ...	26 11	25 11		23 7	24 3		16 0	16 1	
,, 21 ...	26 8	25 9		23 10	24 3		15 11	16 0	
,, 28 ...	26 9	25 9		24 3	24 8		16 1	16 2	
Oct. 5 ...	26 9	26 1		24 9	25 0		16 3	16 3	
,, 12 ...	26 11	26 3		24 10	25 3		16 6	16 7	
,, 19 ...	27 1	26 6		25 0	24 10		16 7	16 8	
,, 26 ...	27 4	26 7		24 11	24 10		16 8	16 10	
Nov. 2 ...	27 10	26 7		24 9	24 8		17 1	16 11	
,, 9 ...	28 3	26 6		24 10	24 8		17 4	17 1	
,, 16 ...	28 7	26 4		24 6	24 4		17 8	17 2	
,, 23 ...	28 5	26 3		24 6	24 1		17 9	17 3	
,, 30 ...	28 8	26 1		24 6	24 1		17 11	17 2	
Dec. 7 ...	28 6	26 1		24 7	24 1		17 11	17 4	
,, 14 ...	28 5	26 1		24 5	23 11		17 11	17 3	
,, 21 ...	28 4	26 3		24 6	24 3		17 11	17 3	
,, 28 ...	28 3	26 0		24 7	24 1		18 1	17 3	

AVERAGE PRICES of **Wheat, Barley,** and **Oats** per Imperial Quarter in FRANCE, BELGIUM, and GERMANY, and at PARIS, BERLIN, and BRESLAU.

—		Wheat. 1906.	Wheat. 1907.	Barley. 1906.	Barley. 1907.	Oats. 1906.	Oats. 1907.
		s. d.	*s. d.*	*s. d.*	*s. d.*	*s. d.*	*s. d.*
France:	April ...	39 10	38 9	25 3	26 2	22 4	22 10
	May ...	39 10	40 3	25 6	26 6	22 9	22 9
Paris:	April ...	40 2	39 10	25 5	26 7	23 3	25 6
	May ...	39 5	41 9	25 10	26 2	23 0	22 11
Belgium:	March ...	30 3	28 10	24 6	25 7	21 5	20 6
	April ...	30 6	29 4	24 7	25 6	21 7	21 7
Germany:	April ...	38 9	41 1	28 7	29 9	23 10	25 4
	May ...	39 4	44 3	26 7	31 6	23 11	26 9
Berlin:	March ...	38 3	41 2	—	—	22 9	25 5
	April ...	39 9	42 4	—	—	23 4	25 11
Breslau:	March ...	35 2	37 2	27 9 (brewing) 25 1 (other)	29 7 (brewing) 23 11 (other)	20 7	23 0
	April ...	35 8	38 6	27 9 (brewing) 25 1 (other)	29 7 (brewing) 25 2 (other)	21 9	23 9

NOTE.—The prices of grain in France have been compiled from the official weekly averages published in the *Journal d'Agriculture Pratique*; the Belgian quotations are the official monthly averages published in the *Moniteur Belge*; the German quotations are taken from the *Deutscher Reichsanzeiger*, the prices for the German Empire representing the average of the prices at a number of markets.

AVERAGE PRICES of **British Wheat, Barley,** and **Oats** at certain Markets during the Month of May, 1906 and 1907.

—	Wheat. 1906.	Wheat. 1907.	Barley. 1906.	Barley. 1907.	Oats. 1906.	Oats. 1907.
	s. d.	*s. d.*	*s. d.*	*s. d.*	*s. d.*	*s. d.*
London...	30 8	29 2	23 2	24 7	20 10	20 10
Norwich	30 1	27 6	25 6	23 2	19 4	19 6
Peterborough	29 10	28 2	22 5	23 0	19 5	19 6
Lincoln...	29 7	27 11	23 0	23 3	19 11	19 9
Doncaster	28 11	27 11	23 9	25 0	19 4	20 2
Salisbury	30 3	28 3	22 4	23 7	20 5	19 11

AVERAGE PRICES of PROVISIONS, POTATOES, and HAY at certain MARKETS in ENGLAND and SCOTLAND in the Month of May, 1907.

(Compiled from Reports received from the Board's Market Reporters.)

Description.	London.		Bristol.		Liverpool.		Glasgow.	
	First Quality.	Second Quality.	First Quality.	Second Quality.	First Quality.	Second Quality.	First Quality.	Second Quality.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
BUTTER :—	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.
British ...	12 9	11 6	13 0	11 9	—	—	13 0	—
	per cwt.	per cwt.	per cwt.	per cwt.	per cwt.	per cwt.	per cwt.	per cwt.
Irish Creamery	100 6	98 6	102 0	98 6	100 0	96 6	100 0	—
,, Factory	92 6	88 6	93 0	86 0	89 6	82 6	—	—
Danish ...	104 6	102 0	—	—	105 6	101 0	104 0	—
Russian ..	92 0	89 0	—	—	90 6	81 6	93 0	86 0
Australian ...	96 0	93 0	96 0	87 0	92 6	89 0	99 0	93 6
New Zealand	99 6	97 6	100 6	98 6	101 0	97 0	99 6	—
CHEESE :—								
British—								
Cheddar ...	85 0	80 0	84 0	72 0	82 0	78 0	72 0	66 0
					120 lb.	120 lb.		
Cheshire ...	—	—	—	—	69 0	64 0	—	—
					per cwt.	per cwt.		
Canadian ...	67 6	66 0	67 6	65 6	66 0	64 6	67 0	64 0
BACON :—								
Irish	66 0	63 0	—	—	66 0	63 0	65 0	63 0
Canadian ...	61 0	60 6	61 0	57 0	60 0	56 6	61 0	58 0
HAMS :—								
Cumberland ...	104 0	99 0	—	—	—	—	—	—
Irish	102 6	96 6	—	—	—	—	83 0	79 0
American (long cut) ...	62 6	61 6	62 6	60 6	63 0	59 6	62 6	61 0
EGGS :—	per 120.	per 120.	per 120.	per 120.	per 120.	per 120.	per 120.	per 120.
British ...	9 7	8 6	8 1	—	—	—	—	—
Irish	8 4	7 7	7 6	7 0	7 5	6 11	8 2	6 11
Danish ...	8 8	7 8	—	—	8 6	7 6	8 4	7 5
POTATOES :—	per ton.	per ton.	per ton.	per ton.	per ton.	per ton.	per ton.	per ton.
Langworthy ...	103 0	95 0	103 0	92 0	—	—	91 0	86 0
Scottish Triumph ...	105 0	98 6	102 0	92 0	91 6	86 6	—	—
Up-to-Date ...	108 0	96 0	105 0	96 0	91 6	86 6	85 0	80 0
HAY :—								
Clover ...	103 0	91 6	90 0	82 6	100 0	77 6	83 0	78 0
Meadow ...	94 6	83 6	85 0	75 0	—	—	82 6	76 0

DISEASES OF ANIMALS ACTS, 1894 to 1903.

NUMBER of OUTBREAKS, and of ANIMALS Attacked or Slaughtered.

GREAT BRITAIN.

(From the Returns of the Board of Agriculture and Fisheries.)

Disease.	May.		5 Months Ended May.	
	1907.	1906.	1907.	1906.
Swine-Fever :—				
Outbreaks	278	144	953	505
Swine Slaughtered as diseased or exposed to infection ...	1,286	773	4,757	2,581
Anthrax :—				
Outbreaks	129	94	501	426
Animals attacked	158	133	686	652
Glanders (including Farcy) :—				
Outbreaks	80	85	385	452
Animals attacked	210	173	910	856
Sheep-Scab :—				
Outbreaks	13	10	389	277

IRELAND.

(From the Returns of the Department of Agriculture and Technical Instruction for Ireland.)

Disease.	May.		5 Months Ended May.	
	1907.	1906.	1907.	1906.
Swine-Fever :—				
Outbreaks	8	13	56	29
Swine Slaughtered as diseased or exposed to infection ...	81	177	973	437
Anthrax :—				
Outbreaks	—	—	1	2
Animals attacked	—	—	3	2
Glanders (including Farcy) :—				
Outbreaks	—	1	—	3
Animals attacked	—	3	—	10
Sheep-Scab :—				
Outbreaks	11	13	158	140

(Wt. 1348 4,000 6 | 07—H & S 1620)

THE JOURNAL
OF THE
BOARD OF AGRICULTURE.

Vol. XIV. No. 4.

JULY, 1907.

MODERN STRAWBERRY GROWING.

I.—VARIETIES.

When we practise "high" or intensive cultivation for fruits and vegetables, the principal object we have in view is the production of notable individual plants and heavy crops, and not the longevity of the species. This is equally the case, whether the system of propagation be seminal or vegetative. The former should, in theory, lead to maintained vigour; that it does not do so may be attributable to the fact that few people take sufficient care in making selections of good types when saving plants for seed. Where vegetative reproduction is concerned, selection can play but a minor part in maintaining vigour, and the "higher" the cultivation the less chance there is of lasting success.

"*Sir Joseph Paxton.*"—The variety of strawberry known as "Sir Joseph Paxton" may be adduced as an illustration. It has held so strong a place in the regard of cultivators that the mention of it instantly engages attention, but its constitution has become so impaired that its retention as the most important modern variety must be seriously challenged. Growers show a natural reluctance to believe that the falling away of "Sir Joseph Paxton" is other than temporary, and hope that some means will be found to restore it to its pristine vigour. For my own part, glad as I should be if I could see any real hope of this most desirable consummation, I am bound to consider it in connection with what has happened to certain other sorts, once largely grown, but now practically forgotten.

(1824) N

Strawberry growers of the present generation have difficulty in recalling the names of "Black Prince," "Keens' Seedling," "Pioneer," and "James Veitch"; "Sir Charles Napier" they remember, but have probably discarded; "La Grosse Sucrée" is grown a little under glass, and that is all. It is doubtful if there is any real basis for the hope that "Sir Joseph Paxton" will escape the fate of these once-popular strawberries. If it had been persistently propagated from weak or semi-barren plants, the chance would remain that improved methods might give it a new lease of life. But it has not been so treated, and further, as has been said, intensive cultivation does not promote longevity. The suggestion has been made that if new stock were introduced to the strawberry fields and gardens of the south from the north of England and Scotland, the vigour of the variety would be renewed. It is evident that growers have been influenced by the success of change of seed in the case of potatoes. But potatoes and strawberries are such totally different plants that no analogy can be drawn. The question of change of stock is not merely in the stage of suggestion. Some experiments have been made, but so far the evidence seems to point to a reversal of the potato results—south to north is better than north to south in the case of strawberries. It is to be hoped that further trials will be made.

"*Royal Sovereign.*"—The reluctance of growers to accept the decline of "Sir Joseph Paxton" as permanent is explained by the fact that it is not only a large, handsome fruit which travels well, but is, in a sense, a successional bearer, that is, the first break of fruit is followed by a second of tangible value. In this respect it holds an advantage over its newer and most powerful rival, "Royal Sovereign," which "finishes off" more quickly. "Royal Sovereign" is a variety of immense value to both field and garden cultivators, and we owe a deep debt of gratitude to its raisers, the Laxtons, of Bedford, who devoted an immense amount of patient care to its development. It is earlier than "Sir Joseph Paxton"—a fact which goes a long way to restore the balance lost by its quicker finish—if, indeed, it does not more than do so. Earliness, if it be not secured at the sacrifice of size, flavour, or carrying capacity, is an asset of enormous value in a market strawberry. Happily "Royal Sovereign" has not earliness alone to recommend it. It is a

large, conical, highly-coloured berry, with firm flesh, which means that it not only looks well when it leaves the farm, but also when it reaches the market. It is impossible to evade the conclusion that "Royal Sovereign" is the most valuable all-round strawberry now before the public. Not only is it a good field and garden sort, but it is also excellent for forcing. In a large number of establishments it has displaced all the old favourites for pot work, such as "La Grosse Sucrée," "Vicomtesse Héricart de Thury," "President," and "Auguste Nicaise." There is no precedent, indeed, for the dominant position which this splendid variety has secured in a comparatively short period. It is still in the full vigour of youth, and for many years to come should do yeoman service both in market and private gardens.

"*The Laxton.*"—The variety which followed "Royal Sovereign" with the hallmark of the Bedford raisers upon it, named "The Laxton," has received high encomiums from distinguished growers. With such famous parents ("Sir Joseph Paxton" and "Royal Sovereign") it should have all the elements of greatness which heredity can bestow, and it is unquestionably a good variety. It is early (though not quite so early as "Royal Sovereign"), prolific, a large, handsome fruit, and excellent in flavour It is, however, a sort to experiment with before planting largely.

Value of Trial Grounds.—Here I would digress for a moment to urge upon large growers the desirability of having a trial ground, wherein every newcomer with the least claim to excellence can be tested directly it comes before the public. Very few think of this, yet its advantages are obvious. It puts the grower at once into practical touch with modern progress. Should a variety prove valuable, he has a small stock from which to propagate, either for his own planting or for sale. An important consideration in this connection is that, as soil and climate have a considerable bearing on the success of strawberries, it is wise to test a sort on the spot before buying largely. The trial should extend over at least two years, because the results of one year are apt to be misleading ; one variety will be stimulated by the change, and do better than when it has settled down ; another will "sulk" a little, and need to become acclimatised. A second point of importance is that the plants

N 2

under trial shall be subjected to the same conditions as they would have when planted in quantity. To test a variety destined for open field culture in specially prepared soil in a sheltered garden might raise hopes that would ultimately be dashed to the ground. Given these two conditions, a trial station has everything to recommend it, and the small cost will be more than balanced by the interest that it will yield.

"*Bedford Champion.*"—A variety that is distinguished for the immense size of its fruits is "Bedford Champion," which sprang from the union of two seedlings, themselves unnamed. One of these seedlings came from a cross between the varieties "Scarlet Queen" and "John Ruskin"—the latter a very small-fruited sort. The other came from a cross between "Noble," an early variety of poor flavour, and "Sir Joseph Paxton." "Bedford Champion" cannot be said to show much in common with any of its four grandparents. It is a quite distinct and prodigiously vigorous variety, but I do not see in it quite a popular market sort, although it is said to travel well.

"*Reward.*"—A variety very remarkable for colour is "Reward," which Laxtons secured from a cross between "Royal Sovereign" and "British Queen." The last-named has long been famous for its fine flavour, and notorious for its poor constitution. So luscious is it, that we have got into a way of quoting "Queen flavour" as the standard by which to judge a variety. So poor a grower is it, that the great majority of cultivators discarded it many years ago. "Reward" is quite in the early trial stage yet, but I already have serious misgivings about it. It is the weakest variety, by many degrees, in all my trials, and looks like dying out, although its companions are healthy and vigorous. Either it is inherently weak in constitution, or it does not like a cold clay soil. Reluctant to have to condemn a variety of such fair promise, I shall watch its progress in a larger trial on the lighter, warmer soil at Wye with hopeful interest.

"*The Bedford.*"—Another main-crop variety which has received some attention is "The Bedford," a cross between "Dr. Hogg" and "Sir Charles Napier." The former is one of our best-flavoured strawberries, and is by no means a bad grower, although not of the best in this respect. "Sir Charles Napier" is an old variety, once highly esteemed, but now

nearly obsolete. It has excellent colour. "The Bedford" may be tried, but on stiff soil it is showing too much of the namby-pambyism of "Dr. Hogg" to satisfy me fully. It may want a warmer soil.

"*Fillbasket.*"—"Fillbasket" is earning favour with many shrewd growers, and is likely to grow in popularity on account of its remarkable productiveness. It is the result of a cross between "Royal Sovereign" and "Latest of All," two strawberries of marked excellence. It sets its fruit with as much freedom as the former, and is as good in flavour as the latter, which is high praise. It is not quite a novelty, having been before the public some few years, and it has made steady progress by sheer merit.

"*Louis Gauthier.*"—That a strawberry may possess in the highest degree the qualities of vigorous growth, abundant fruitfulness, and splendid flavour, and yet never become popular, is proved in the case of the variety "Louis Gauthier." Here is a strawberry which combines almost every good quality, yet has one defect that is fatal from the market point of view—want of colour. I most strongly urge private growers to try this magnificent and inexpensive variety. It has far more of the perpetual character than "ever-bearing" varieties of the stamp of "St. Joseph" and "St. Antoine de Padoue," to the former of which I would not give a yard of garden room. "Louis Gauthier" produces an extraordinary succession of fruit, which swells to a good size, and is very juicy. As to the habit of the plant, it is nearly as vigorous as Cottagers' Kale. Like "Royal Sovereign" and "Vicomtesse Héricart de Thury," it is an excellent forcer.

Late Varieties.—Turning to the late varieties, the fact may be noticed that there is a growing tendency on the part of market men to lengthen the strawberry season. Years ago little interest was shown in late sorts. In all directions the cry was for earliness. Possibly the fact that most of the late varieties were either too small or too poor in colour to attract the attention of the public had something to do with the coldness of growers. Whether or not want of size and colour had anything to do with it, the fact remains that late strawberries have not hitherto been highly esteemed. It is equally certain that they now promise to come into favour. Three varieties

which are receiving a good deal of attention as late varieties are "Laxton's Latest," "Progress," and "Givon's Late Prolific." Dealing with these in the order of their names, "Laxton's Latest" may be first referred to. In passing, I cannot but think that this variety was somewhat unfortunately named, inasmuch as we have had in cultivation for several years, and raised by the same firm, a variety called "Latest of All." Confusion between the two seems to be inevitable. However, there is a difference between their seasons, for "Latest of All" is not a very late variety, as compared with "Waterloo," for example, whereas "Latest" certainly is. "Latest of All" (a mid-season variety of excellent flavour) was one of its parents, and an unnamed seedling the other. "Latest" is well worthy of trial."

"*Progress.*"—"Progress" is absolutely new, and as yet quite untried, except on the grounds of the raisers. It is a cross between "British Queen" and "Latest of All," and is said to be as late as "Waterloo," but brighter in colour. Having no acquaintance with it beyond seeing the fruit, I cannot do more than indicate it as a sort to be tested.

"*Givon's Late Prolific.*"—"Givon's Late Prolific" has almost got beyond the experimental stage, and it is a proof of the real want that existed for a good late strawberry that it should so soon have spread into thousands of private gardens, and on to a considerable number of farms. The result of a cross between "Waterloo" and "Latest of All," it more resembles the former than the latter, but it is somewhat brighter in colour and much more prolific. The flavour is as good as "Waterloo" We need not say better, because the strong point of the latter is its flavour. Where "Waterloo" has failed is as a hardy, free-bearing strawberry that would do on a variety of soils. Under special garden culture it has done well in many places, but has not proved itself adaptable, and hence the opening for a high-class late sort which has existed for some time past. Those who want to plant a late strawberry somewhat largely would probably be well advised to select "Givon's Late Prolific."

II.—SOME CULTURAL PROBLEMS.

Fruiting first Year after Planting.—The strawberry is a plant of free and generous nature, yielding readily to the cultural

restraints that we put upon it. This is, in one sense, a little unfortunate, as some growers seem to think that any treatment will do for a strawberry. Certainly the plant is often subjected to a rough-and-ready routine—especially as regards propagation—that gives it no chance to crop heavily within a short period, and necessitates its being grown for two years before it can give a good return. The better a valuable plant grows, the better we ought to treat it, for if in nature and habit it be strong and kindly, it will prove responsive to good treatment. Experienced growers do not need to be told that the quick or slow fruiting of a strawberry plant turns on the readiness with which it forms a "crown." The crown is the thickened heart of the plant, on which the plant concentrates itself—root, stem, and leaf. If we examine a strong strawberry plant just after blooming in summer, there will be no crown worth speaking of, because it has burst, and produced flower-stem and blossoms; there will only be leaves and roots besides the flowers. If the same plant is examined again in autumn, another thickened heart will be found to have formed; that is, the plant is preparing itself for another year's fruiting. As a rule, the crown is only half finished then, and between November and June it will thicken and solidify in a very marked degree. If the soil be good and root-production vigorous, a plant which shows only a small crown, the size of a large pea, in October, may by the June following develop a heart as big as a large thimble, and produce a good cluster of large flowers. My object in calling attention to this is to show that the common idea that a strawberry plant cannot form a really strong fruiting crown in its first year, and every year, is wrong. Many market growers argue that a young strawberry should be grown two years before it is fruited, in order to get a strong plant, but if a strawberry crop be properly managed, it will give an appreciable amount of fruit the first year, and make just as good a plant the second, as the average of those which most growers produce in two years. The importance of this lies in the fact that we get a turn-over on capital a year in advance. The explanation of the fact that a considerable section of so shrewd and active a body of men as the market growers adopt the one-crop-in-two-years system with young strawberries may lie partly in the fact that they have their employés very full of work when the first runners come in

summer, and comparatively slack in autumn. They thus do not trouble to take the early runners, but take late ones in October or November. On this two comments may be offered : The first, that one quick man (or woman) can take several hundreds of runners in a few days ; the second, that the period of three months thus gained has an immense effect in helping on the development of fruiting crowns.

Planting Early Runners.—Those who grow strawberries for forcing invariably make a point of getting early runners, because experience has taught them that only by this means can they be sure of getting plants with plump, well-developed flowering crowns within a few months. They like to get the first plant on each runner. It is not the fact, as is sometimes asserted, that if a runner, after forming its first plant, goes on to form a second and a third, the latter are worthless, and likely to give barren plants. If a parent plant be itself barren (in the sense, that is, of not producing flowers when it has grown to a good size) it is certainly likely—nay, almost certain—to give progeny that is also barren. But what we may term secondary runners are not necessarily barren if the parent is fertile. While stating this, however, I still think that the man who wants quick-fruiting plants should pounce down on the first plantlet which shows and secure it.

Runners may begin to push in May or June. They should be allowed to remain if the plants are strong ones ; but they should be removed if the plants are weak. A backward plant under a year old, concentrating itself on the development of its first truss of flowers, should be denuded of its runners directly they show. Ripening a small crop of fruit will put quite sufficient work on the plant without subjecting it to any further strain. But stronger, more forward plants, which have had abundance of time in which to form their crown, will be quite capable of developing a crop of fruit and forming sturdy young plantlets at the same time.

The plantlet forms on the runner at a distance of a foot, more or less, from the parent. The end of the runner will thicken, a mass of brownish roots will form round it, and little green growths, soon recognisable as leaves, will begin to push out. This is the embryo plant. If we neglect it, it will proceed to push out roots in the soil, and, having established itself, to

throw out a secondary runner, which will produce a plantlet in its turn. The main runners—those which spring direct from the plant—are the strongest, and the first plantlet the best. These are the ones that the forcer takes, and these are the ones any grower should secure who wants to have fruiting plants the following year. They are best struck in small pots, the 3-in. size being suitable. Some propagators stand the pots on the soil round the plant, but it reduces labour in watering if they are plunged to the brim in the soil. As the plants will not be in the pots very long, it is not necessary to go to a great deal of trouble in draining the pots. One piece of crock is sufficient, and some growers do not even use that, but put in a few flakes of leaf mould. The compost for the pots may be ordinary earth, but half leaf mould and half loam, with a good sprinkling of sand, is better, as it encourages early rooting. If the plants are in fruit the beds will be under straw, in which case it should be pulled aside here and there to facilitate sinking the pots. It is not necessary to make any incision on the plantlet or runner. If the former be laid on the soil in the middle of the pot, pressed firmly, and kept in position with a peg or stone, it is certain to root, and that quickly.

Plants that are struck in this way will have a spread of 4 in. and be 4 or 5 in. high in August. If planted at the first favourable opportunity, that is, after the warm ground has been well moistened by a heavy shower, they will establish themselves at once, and inside a week be growing freely. From that time onward they will thicken steadily at the heart, and have fruiting crowns the following June. Stress is laid on early planting by some growers. I do not find this so material as getting strong plants and putting them in when the land is right. This may not be till October, or even until spring. I have more than once turned out pot plants in March, and had a nice crop the same summer. Other things being equal, however, early planting is advisable.

Re-Planting every Three Years.—When the grower goes in for early fruiting plants, he finds himself committed to what I believe will be the method of the future, annual summer propagation, high-pressure cultivation, three crops at the most, and then—a new plantation. The more experience he has of the system the more it will grow in favour. The temptation

to keep old beds and save the trouble and expense of making new ones is too strong for some amateurs, but trade growers get it knocked out of them by painful experience. A strawberry plant is generally at its best in its second year. The third shows a decline, which may be only slight, or may be strongly marked, according to the quality of the soil. It may be said that this decline can be arrested by manuring, but herein lies a difficulty. Merely spreading on a mulching of manure or turning manure in between the rows is not sufficient, and the only resource is to make new beds. It may be taken as established that it is more economical to do this than to endeavour to maintain the productiveness of old ones. A comparison of the length of time the ground is occupied by plants fruiting for the first time in the first and second years respectively, each set fruiting three times, shows the advantage of the first method, as follows :—*First Method :* Plants struck early in 1907, and fruited in the summers of 1908, 1909, 1910, and then done away with ; *Second Method :* Plants struck late in 1907, grown on in the summer of 1908, and fruited in the summers of 1909, 1910, 1911, and then cleared away. Thus the second set would be in hand one year longer than the other, and, in order to balance accounts, it should give proportionately more fruit.

Manuring.—A problem hardly less important than that of early or late propagation is that of manuring. Even trade growers themselves, who do not eat the fruit which they cultivate, but are mainly concerned in growing as much as possible of marketable quality, are beginning to point to the softness of flesh and coarseness of flavour which accompany the very heavy dressings of yard manure that are now the rule. Since it is so difficult to maintain the fertility of a strawberry bed by subsequent manuring, the grower is naturally anxious to "do" his soil well at the outset, in order that the plants may have something to feed upon for three or four years. This is the explanation of the heavy manuring that is practised. The alternative is to reduce the bulk of the manure and supplement the fruit-forming constituents with certain chemicals. These fruit-formers will not be found in nitrates, and the grower who adds nitrate of soda or sulphate of ammonia to his yard manure is simply stimulating leaf growth and wasting his money. Assuming that his dung is of good quality, it will yield all the

nitrates that strawberries want without any addition. It is to phosphates and potash that he must turn for his supplementary fertilisers, and if he use them with judgment, he will find the results satisfactory. The value of mineral superphosphate, costing about £3 per ton, is altogether underestimated by strawberry growers. A fair commercial sample will yield about 26 per cent. of soluble phosphates. A reasonable rate of application for strong land is to allow 2 stones (28 lb.) to every ton of manure if 25 tons or over are applied. Thus, if 30 tons of manure were applied per acre, the quantity of superphosphate would be 7½ cwt. exactly. At £3 per ton this would cost £1 2*s*. 6*d*., which can easily be saved out of the manure, for 30 tons per acre is often exceeded. If the manure applied should fall below 25 tons, the quantity of superphosphate per ton might be increased to 2½ stones (35 lb.) per ton.

Character of Soil.—In this matter of manuring the grower must be guided by the nature of his soil. Strong loams, inclining to clay, do not require anything like the amount of manure which light land does. If such land lie fairly warm, it is almost ideal strawberry soil. One great thing in its favour is that it holds moisture well, and a moisture-retaining soil never requires so much manure as land that quickly "dries out." Those who grow strawberries on light land will be wise to supplement yard manure with a selected potash fertiliser. Sulphate of potash is excellent, and the fact that it is relatively expensive need not deter the grower from using it, as the quantity needed is not considerable; ¾ stone per ton of manure will suffice. Like superphosphate, it may be drilled in before planting, or mixed in with the manure while the latter is rotting in the heap.

The reason why most varieties of strawberries do not thrive in light land is that it is not moist enough. Merely adding manure will not make it right, though it will improve matters. What is wanted is deeper culture. Heavy land is supposed to be more expensive to work than light ground, but if a proper profit and loss account were kept, I think it would be found that stiff soil pays better for strawberries than light. I have not yet found the clay (which so many strawberry growers dread) that is too stiff for this fruit, provided it is drained. The vigour that most varieties display on stiff land which receives but a

limited quantity of dung is remarkable. A dry season, so trying on light land, has very little effect on plants in stiff soil.

My conviction that heavy soil is more economical than light for strawberries, taking into consideration durability of the plant and yield of fruit, is based on some amount of experience. In handling light soils, I found that only by trenching and heavy manuring could a plant be kept going for even three years. This makes culture an expensive item. If I had a warm situation, I should never hesitate to plant strawberries on clay, and I do not think that the objection which many growers have to this class of soil is well based. Such land has sterling qualities, it produces plants of immense and sustained vigour. The one serious objection is lateness, but this is most marked where the situation is unfavourable. Clay with shade, or clay on a northern slope, must stand condemned.

In view of the large quantities of yard manure now used for strawberries, it behoves growers who have cause to complain of scanty crops to think twice before they condemn the plants as going barren. One sees strawberries making an immense amount of top sometimes, and yet when examined the crowns are found to be small. This may be the result of over-manuring rather than of an inherent tendency to barrenness; anyway, a dressing of quicklime scratched in at the rate of 3 to 4 tons per acre cannot possibly do any harm, and is very likely to do good. It should be followed by a dressing of superphosphate at the rate already mentioned. A good time to apply this is February.

Cultivation for One Crop only.—What gardeners term "culture as annuals" is beginning to engage the attention of growers, and it may be well to consider this system, which is certainly spreading in private gardens. "Culture as annuals" means that the plants are pushed rapidly on from early runners, fruited once, and then done away with. This seems somewhat revolutionary, but when one considers all the circumstances, it has a good deal to commend it for private gardens. The crop falls in with the rotation of a large kitchen garden almost as though it were a vegetable. For instance, a gardener may take a crop of early peas or potatoes from one of his kitchen garden quarters in July, manure the ground, and have it ready for strawberries in August. The following year he will be able

to gather his fruit by mid-July at the latest, unless the variety is a very late one, dig the plants in, and plant a crop of savoys or sow onions. I have been astonished at the magnificent plants some growers turn out in a year ; even experienced cultivators might be deceived into thinking they were at least two years old. While, however, the system is quite practicable in a private garden, a little reflection will show that it is not so suitable for market growers with large cultures, unless (1) their land is of the best, and (2) they can command a special price for a limited quantity of fine fruit. These "biennial" plants do not, except in special cases, yield a great bulk of fruit, but produce a few very large and juicy examples. If the grower could find a special market for selected fruit at an enhanced price, he might have no cause for complaint, but ordinary rates would not be remunerative. There is, too, the question of the previous and successional crops to consider. The strawberries go on the ground one year, and come off it the next, at a period when only a limited number of vegetable crops are available for clearing off or planting, as the case may be. I do not seek to condemn the "once-fruiting" system. It is interesting, and is conducted by many gardeners in a way that redounds greatly to their credit. But I am not quite sure that it could be carried out with equal success by the rank and file of market growers. Anyway, they will be wise to look at it in all its bearings before they put much money into it. WALTER P. WRIGHT.

VARIATIONS IN THE COMPOSITION OF MILK.

ALEX. LAUDER, D.Sc.

In 1900 a Departmental Committee was appointed by the Board of Agriculture to enquire into the composition of milk, with special reference to the provision of Regulations under Section 4 of the Food and Drugs Act, 1899 ; and, since that time, the subject has attracted increased attention, not only on the part of the chemist, but also on the part of the practical dairy farmer.

Articles have appeared in this *Journal* from time to time emphasizing the importance to the dairy farmer of a knowledge of the quantity and quality of the milk produced by his cows,

not only as a means of determining which are the unprofitable animals in his herd, but also with the object of assuring him that the milk which he is supplying to the public conforms in quality with the Sale of Milk Regulations. (See Leaflet No 146 and *Journal*, May, 1907, p. 88.)

To assist those who are not in a position to carry out the necessary tests for themselves, the Board of Agriculture have made arrangements with the various Agricultural Colleges in different parts of the country, whereby the farmer can have the percentage of fat in his milk determined at the nominal fee of 6d. per sample. This scheme has now been in operation for nearly two years, and has been taken advantage of to a considerable extent (see *Journal*, June, 1907, p. 177). In the case of large herds of cows, however, if this work is to be really effective, it must be done by the large dairy farmers themselves, and it is not difficult to prove that the accurate information obtained in this way will amply compensate them for the trouble and expense involved in systematic testing.

When we consider the average composition of milk, it may be pointed out that if the number of samples examined is large the average composition is wonderfully constant. In a paper recently read before the Society of Public Analysts (Droop Richmond, *Analyst*, XXXI, 1906, 176), the results were given of the analyses made during the year 1905 of 31,120 samples of milk from the South of England. The average composition was as follows :—

	Percentage of Fat.	Percentage of Total Solids.
Morning Milk	3·54 ...	12·53
Evening ,, ...	3·91 ...	12·86

These figures are practically the same as the average figures found in the previous year, the fat differing by only ·01 per cent.

An enquiry into the composition of milk must show, however, not only the average composition of the milk, but also the limits within which variation usually takes place. The further question is also raised as to how far the average composition is the same in different parts of the country, and to what extent the composition and the limits of variation are affected by the different breeds of cattle employed, and the different climatic conditions which obtain there. Both these questions were discussed at the Departmental enquiry

already referred to, and while much valuable evidence was brought forward, it was also quite evident that there was great need of systematic work on the limits of variation in different parts of the country.

The investigations which are described in this article were undertaken with the view of obtaining information as to the variation in composition of milk in the East of Scotland, where not only the climatic conditions differ markedly from those obtaining in the West, but where, in addition, a different breed of dairy cattle is employed. It was also hoped that the results of the investigation would serve to stimulate interest in the subject of milk testing on the part of the dairy farmer, and would provide an additional object lesson on the value, from a commercial point of view, of the information to be obtained in this way.

Through the courtesy of the Farm Committees of the Mid-Lothian and Peebles County Asylum, and the Fife and Kinross County Asylum, respectively, the dairy herds at Rosslynlee, Mid-Lothian, and at Springfield, Cupar, Fife, were placed at my disposal for the purpose.

A systematic examination of the milk at Rosslynlee was commenced in May, 1905, and is still in progress. At Springfield the work was carried on from June till October, 1905.

As the whole of the milk produced both at Rosslynlee and Springfield is consumed in the asylums, the calving of the cows is arranged, as far as practicable, so as to provide as regular a supply of milk as possible all the year round. It was therefore not possible to get a sufficient number of cows calving about the same time to make it worth while trying any extended experiment in feeding, even if this had been desirable. Indeed, bearing in mind the objects of the investigation, it was thought better that the management of the herds should be interfered with as little as possible, in order to get a better idea of the variation in quality and quantity in the milk of herds kept under first-class commercial conditions. It is sufficient to say that the feeding was ample and varied, and that the ordinary practice of the farms in this respect was not departed from.

The herd at Rosslynlee consisted, on the average, of 22 cows of the ordinary dairy shorthorn type, varying in age between

6 and 9 years. They were milked in the morning at 6.30, and in the afternoon at 4 o'clock, the intervals between the times of milking being thus 9½ and 14½ hours respectively.

The milk of each cow was sampled at the morning and evening milkings once a week, and on the same day the mixed milk of the herd was also sampled. The yield of milk given by each cow at every milking was also determined by weighing with a spring balance in the usual way. After being weighed, the milk was poured through a sieve, and then from one pail to another several times, until it was thoroughly mixed. A sample was immediately taken by dipping, and transferred to a clean glass bottle. The bottles were despatched in specially constructed boxes to Edinburgh immediately after the evening milk was sampled.

Of the 22 cows in the herd, 16 have been there for one year or longer. In Table I these 16 cows are arranged in order of yield, the average percentage of fat in the morning and evening milk being also given. The yield is for the year May, 1905 to May, 1906, and the number of weeks *in this period* during which the cows gave milk is given in column 4.

TABLE I.—Showing Cows arranged in the Order of their Yield of Milk for the Year 1905–06.

No. of Cow.	Age in Years.	Date of Calving.	Weeks in Milk.	Yield of Milk in Gallons.	Order.	Average Per Cent. of Fat.	
						A.M.	P.M.
7	9	June 5, 1905 ...	47	1,505	1st	2·84	3·40
3	9	June 18, 1905 ...	45	1,207	2nd	2·34	2·61
23	7	Oct. 15, 1905 ...	49	1,089	3rd	3·32	4·31
22	7	Feb. 7, 1906 ...	48	991	4th	3·37	4·52
4	7	Oct. 17, 1905 ...	40	942	5th	3·33	3·79
19	...	Oct. 10, 1905 ...	49	892	6th	3·64	4·41
20	8	Nov. 14, 1905 ...	49	861	7th	3·46	4·24
2	7	Dec. 26, 1905 ...	46	841	8th	3·96	4·07
17	6	Jan. 3, 1906 ...	39	801	9th	3·43	4·16
21	7	Before May 1905	52	788	10th	4·02	4·69
5	7	May 16, 1906 ...	43	772	11th	3·43	3·74
8	7	March 18, 1906...	37	767	12th	3·33	3·98
24	8	May 2, 1906 ...	38	743	13th	3·31	3·99
14	7	May 23, 1905 ...	40	655	14th	3·58	4·81
9	9	Aug. 25, 1905 ...	35	638	15th	2·96	3·50
11	10	Nov. 25, 1905 ...	39	478	16th	3·15	3·60

The average yield for the year of the 16 cows in the above

Table is 873 gallons. The milk of cow No. 7, which heads the list as regards yield, had an average of 2·84 per cent. fat in the morning and 3·40 per cent. fat in the afternoon. There is little doubt that if this cow had been milked at equal intervals, its milk, both morning and evening, would have been above the standard for fat; cow No. 3, which is second in point of quantity, gives much poorer milk. Of the 16 cows in the above table, only three of them—Nos. 7, 3 and 9—gave milk with an average of less than 3 per cent. of fat in the morning, and only cow No. 3 had an average of less than 3 per cent. of fat in the evening milk. It is worth noting that many cows whose *average* percentage of fat is well above 3 per cent. frequently gave milk containing less fat than this, especially in the morning.

With regard to the relation between quantity and quality, it cannot be stated generally that when the yield is large the quality is poor, or *vice versa*. For example, cows Nos. 9 and 11, the second last and last cows respectively on the list in respect of yield, give much poorer milk than many of the cows which stand above them in the list as regards quantity.

Mixed Milk of the Herd.—The percentage of fat in the mixed milk of the herd was well above 3 per cent. till about the middle of January, 1906. A gradual falling off in quality then commenced, the milk remaining poor right on into June. Cow No. 3, and several others giving poor milk, have now been removed from the herd, and the quality of the milk this spring has distinctly improved.

Composition of the Morning and Evening Milk.—The average percentage of fat in the mixed milk of the herd was 3·15 in the morning and 3·91 in the evening, a difference of no less than ·76 per cent. It has already been pointed out that the intervals between the times of milking are very unequal, $9\frac{1}{2}$ and $14\frac{1}{2}$ hours respectively, and that this is probably responsible for the greater part of the difference between the morning and evening milk. During the month of August, the effect of milking at equal intervals was tried, and the results (Table II) are in full agreement with those recently obtained by Crowther at the Experimental Farm of the University of Leeds, and fully confirm the view as to the cause of the inequality stated above.

TABLE II.—Effect of Milking at Equal and Unequal Intervals on the Composition of the Milk (Morning and Evening).

Date.	Morning, 6.30 A.M.		Evening, 4 P.M.	
	Per Cent. of Fat.	Per Cent. of Total Solids.	Per Cent. of Fat.	Per Cent. of Total Solids.
1906.				
June 27 ...	2·9	11·88	4·15	12·92
July 4 ...	3·15	12·0	4·0	12·78
,, 11 ...	3·15	11·95	4·0	12·75
,, 18 ...	3·2	12·15	4·1	13·22
,, 25 ...	3·3	12·1	4·1	12·78
Average ...	3·14	12·01	4·07	12·89
	Morning, 5.30 A.M.		Evening, 5.30. P.M.	
August 1 ...	3·7	12·90	3·9	12·45
,, 8 ...	3·5	12·38	3·9	12·98
,, 15 ...	3·95	12·85	3·65	12·32
,, 22 ...	3·55	12·35	3·35	11·92
Average ...	3·67	12·62	3·70	12·42

Difference between morning and evening milk :—

	Unequal Intervals.	Equal Intervals.
	Per cent.	Per cent.
Fat	0·93 ...	0·03
Total solids	0·88 ...	0·20

It is seen that the difference in the percentage of fat between the morning and the evening milk has been reduced from ·93 per cent. in July to ·03 per cent. in August; similarly the difference in the total solids has been reduced from ·88 per cent. to ·2 per cent. The total yield of fat is probably not greatly affected by the times of milking, but when milk as uniform in quality as possible is required, it is evident that very unequal intervals should be avoided, a difficulty that is by no means always easy to get over in practice. A comparison of the results at Rosslynlee, with the figures obtained at Springfield where the milking was done at equal intervals, also shows in a marked manner the importance of this factor.

The composition of the mixed milk of the herd at Springfield

was much more uniform in composition than that at Rosslynlee, as will be seen from the following figures :—

	Springfield. Average Percentage of Fat.	Rosslynlee. Average Percentage of Fat.
Morning	3·95	3·15
Evening	3·88	3·91
Difference	0·07	0·76

In the next table the milk produced by cows in the herd at Rosslynlee is valued at 6¼d. per gallon, and the figures serve to illustrate the striking variations in the value of the produce, which may be yielded by different cows in the same herd under the same conditions.

TABLE III.—Showing the Value of the Milk Produced by each Cow for the Year 1905–06.

No. of Cow.	Age.	Yield of Milk in Gallons.	Average Per Cent. of Fat.	Order.	Value of Milk at 6¼*d.* per gallon. £ *s.* *d.*
7	9	1,505	3·12	1st	39 4 0
3	9	1,207	2·47	2nd	31 8 0
23	7	1,089	3·81	3rd	28 7 0
22	7	991	3·94	4th	25 16 0
4	7	942	3·56	5th	24 10 0
19	...	892	4·02	6th	23 4 0
20	8	861	3·85	7th	22 8 0
2	7	841	4·01	8th	21 18 0
17	6	801	3·79	9th	20 17 0
21	7	788	4·35	10th	20 10 0
5	7	772	3·58	11th	20 2 0
8	7	767	3·65	12th	19 19 0
24	8	743	3·65	13th	19 7 0
14	7	655	4·19	14th	17 1 0
9	9	638	3·23	15th	16 12 0
11	10	478	3·37	16th	12 9 0

	£ *s.* *d.*	Average. £ *s.* *d.*
Total for first five	149 5 0	29 17 0
,, last five	85 8 0	17 1 0
Difference ...	63 17 0	12 16 0

The difference in value of the produce of the best and the worst cows, respectively, is over £26 ; the average of the first five is £29 17*s.*, and of the last five £17 1*s.*—a difference of £12 16*s.* It is hardly necessary to emphasize the significance

O 2

of these figures to the practical farmer. In the above comparison no allowance has been made for the difference in quality of the milk of the various cows. If the yield in each case was calculated to some common standard of quality, the order would, of course, be considerably altered, and a more accurate comparison obtained.

At Rosslynlee the heifer calves of cows which are heavy milkers, and which give milk of good quality, are being kept with the view of gradually eliminating the poorer cows from the herd.

Notes on Insect, Fungous and other Pests.*

MOTHS.—Several species of moths or moth caterpillars have been received from various parts of the country. The caterpillars of Winter moths appear to have been very prevalent in parts of Kent and Norfolk, and specimens were sent from Sittingbourne, King's Lynn, Twyford (Notts) and Ely. The caterpillars and pupæ of a Tortrix moth were also received from Sittingbourne, the pupæ being found between leaves which had been spun together. All such leaves should at once be snipped off and destroyed; the treatment recommended against Winter moth caterpillars (see Leaflet o. 4) is effective against the feeding Tortrix larvæ.

In a consignment of insects from King's Lynn, Winter moth caterpillars were chiefly prevalent, although other pests were also present; while a predaceous *Carabus* grub, two species of Ladybird (*Coccinellidæ*), two Ichneumon flies and two species of spider were included. All the latter are useful insects, and this fact should warn farmers and others against a wanton destruction of insect life. Many insects are very useful and generally it is inadvisable to destroy insects without evidence that they are harmful.

A species of Geometrid moth caterpillar was forwarded from Southend-on-Sea, where it was infesting roses. Such caterpillars may be distinguished from other caterpillars by the fact that a number of the abdominal prolegs are absent, legs only being present at the front and hind ends. The

* Notes on insect, fungous and other pests, dealing with the specimens submitted to the Board for identification and their apparent prevalence, will appear in this *Journal* month by month (see *Journal*, June, 1907, p. 155).

caterpillars, therefore, move by a looping or spanning movement, hence being named Geometers, Loopers or Spanners. In numbers they may be very destructive. In the case of roses being attacked, the caterpillars should be hand-picked and destroyed. They may, however, easily be overlooked owing to their habit of mimicking twigs, holding on by their hind feet and keeping their bodies stretched out quite motionless for prolonged periods.

Eyed Hawk Moth.—From East Finchley two examples of the large Eyed Hawk Moth, *Smerinthus ocellatus*, were received. They were apparently egg-laying on apple trees, the foliage of which, especially in the case of young trees, might be much damaged by the caterpillars hatched later on. Poplars and willows are also infested. The caterpillars vary much in colour during their growth. They are generally apple-green, with rough skin dotted with white, while on each side seven white stripes slope backwards. At the tail end is a projecting horn-like structure. The caterpillars attain a large size, reaching by autumn a length of $2\frac{1}{2}$ to 3 in., but, notwithstanding their size, they may easily be overlooked owing to their protective coloration. When the moths have been seen flying round apple trees, careful observation should be kept for caterpillars towards the end of June and during July, and if found they should be hand-picked or shaken from the trees and destroyed. The moths have been noticed egg-laying early in June.

Figure-of-8 Moth.—With specimens of Winter moth caterpillars from Ely were forwarded also those of the Figure-of-8 Moth, *Diloba coeruleocephala*. These caterpillars are orchard pests, but feed also on the leaves of various trees. They have not a very good grip of the plant, and can be shaken down or knocked off with heavy washings. The moths fly in September and onwards, issuing from cocoons attached to twigs, &c., of the plants on which they feed. They come readily to lights, so that if any open shed be near the attacked trees the moths can be trapped by tarring the roof of the shed and attracting them at night by lighted lamps. The caterpillar may be poisoned by spraying with Paris green or arsenate of lead, as recommended in Leaflet No. 4 for Winter moth caterpillars.

Magpie Moth on Euonymus.—Near Blackpool the caterpillars

of the Magpie Moth, *Abraxas grossulariata* (*see* Leaflet No. 20), were found attacking *Euonymus japonica* and varieties, which were much damaged. It is interesting to note that in this case the caterpillars had neglected gooseberries and currants, which are their favourite food plants, although it is known that they do not confine themselves to plants of one Natural Order.

BEETLES.—Two destructive beetles—the Mustard Beetle and the Turnip and Mustard Blossom Beetle—were forwarded at the end of May from Lynn, where they were infesting several acres of brown mustard about a foot high.

The Mustard Beetle (*Phaedon betulæ*).—This beetle hibernates in various shelter places, *e.g.*, in the mustard stubble and in the hollow stems of other plants. The eggs are laid in spring and summer, and both grubs and beetles feed on the growing plants. Pupation takes place in the soil. As a remedial measure against the adult beetles the shaking of the beetles into pails containing a little paraffin has been tried with success in some cases. It should, however, be done early in the morning. The beetles can also be dislodged and collected by dragging tarred strips of sacking attached to a rod over the plants. It has been observed that later in the year, the beetles may migrate in great numbers to other fields, and if this be noticed a shallow trench should be dug in the path of the migrating swarm ; if the trench be kept tarred many beetles will be caught. This measure has been found useful notwithstanding the fact that the beetles have wings. Spraying the infested plants with Paris green would also prove destructive to the insects.

Turnip and Mustard Blossom Beetle.—The second beetle infesting the mustard was the Turnip and Mustard Blossom Beetle (*Meligethes aeneus*). This small beetle lays its eggs in the buds, and there the grubs feed on hatching. The upper part of the flower stalk is also destroyed. As in the case of the last beetle, pupation takes place in the soil.

It should be noticed that both beetles willingly take other cruciferous crops, *e.g.*, rape and turnip, and that attacks have sometimes been so serious that it has been necessary to discontinue mustard growing for some years.

Willow Beetle.—Specimens of the Willow Beetle, *Phratora vitellinæ*, were received towards the end of May from Turriff, N.B.

This insect is frequently very destructive to willows and should be destroyed. The beetles may be shaken or jarred off the trees into pails containing a little paraffin, or on to tarred boards. If such methods are not convenient the trees should be sprayed with Paris green, 1 lb. in 150 gallons of water.

Banded Ash-Borer Beetle.—Specimens of a wood-boring beetle which was found in stored ash timber were submitted to the Board early in June. During 1905 it was discovered that a stack of American ash was badly infested with a destructive beetle. The stack of timber was at once broken down and the space thoroughly cleared and cleaned; the remaining stock of American ash was used up as quickly as possible, and further purchases were not made. There was no further development until in April last a load was taken from a stack of English ash put up in 1904. It was then found that one plank was honeycombed in a similar manner to the American wood, and the beetles were afterwards identified as the Banded Ash-Borer, *Neoclytus caprea*. The insect is an American species, which, in the United States, has at various times done very great damage to ash, and has also been found in the felled trunks of elm and hickory.

The fact that this beetle, introduced in ash from America, has found an environment suitable for its egg-laying, development, and issue in Britain, affords an additional and interesting proof that we owe some of our insect enemies to importations from abroad. There is always the danger that insects, not British, introduced in timber may become naturalised. This danger is certainly present in the case of the family *Cerambycidæ*, or Longicorns, to which the species *Neoclytus caprea* belongs, as the adults are hardy and may be good fliers. An adult longicorn, *Goes tigrina*, a harmful (United States) species, has been taken alive by Dr. MacDougall from a piece of American oak sold at Liverpool, while it is believed that another American longicorn has become naturalised near Manchester.

The *Cerambycidæ* are a very large family of beetles, the members of which frequent plants. The adults are found resting in flowers or in bundles of dried twigs or on tree trunks. The larvæ or grubs are borers, and live, according to the species, below the bark, in the youngest wood, or

in the hard wood. They may be legless, but typically bear three pairs of very short thoracic legs, while the movement of the grubs along the galleries they bore in the wood is aided by fleshy projections from the body. Some species attack coniferous trees, some attack broad-leaved trees, while others infest felled timber and the woodwork of houses and buildings.

Neoclytus caprea lays its eggs both in dying trees and in logs. From the eggs, grubs are hatched which gnaw galleries into the wood, the galleries being filled with frass. When the grub is full fed, it pupates in the gallery and later the adult beetle issues by a round hole. The length of life in the larval stage varies according to the conditions of life, and with some of the *Cerambycidæ* has been known to extend to several years.

As regards preventive and remedial measures the following suggestions may be made :—(1) Wood not already infested can be protected by being steeped in or painted over with such poisonous materials as sulphate of copper (wood so treated becomes somewhat brittle), chloride of zinc (a 2 to 3 per cent. solution), or corrosive sublimate—a dangerous poison, a fact to be borne in mind if the timber so treated is to be used in houses. (2) New timber should be carefully isolated. To put it in the same shed or stack with wood already infested is to invite an attack. (3) Before being set aside for storing, new timber should be examined, and any holes made by the insect should be treated with corrosive sublimate ; or the mouth of the burrow may be cleaned out, and some bisulphide of carbon injected with a syringe, the hole being plugged up at once with thick clay. (4) Infested timber may be painted over with, or be steeped in, the following mixture : 780 grains naphthalene, 80 grains corrosive sublimate, $1\frac{1}{2}$ pints methylated spirits ; special care should be given to the crevices. (5) Badly infested material should be burnt, as it may easily form a centre for the spread of a new infestation.

Green Leaf Weevil.—Species of the Green Leaf Weevil, *Phyllobius maculicornis*, were sent from Hadleigh, Suffolk, where they were feeding on apple trees. The genus *Phyllobius* includes several species, which occasionally cause considerable damage to both fruit and forest trees, the leaves of which they destroy. A single species does not confine its attack to one kind of tree. The following treatment may be recom-

mended :—(1) The beetles may be shaken from the trees on to tarred boards or sacks spread beneath, the best results being obtained if the work be undertaken in the early morning. There are records of infested gardens being well cleared of the insects in this manner. (2) The foliage may be sprayed with a mixture of 1 lb. of Paris green in 250 gallons of water.

Carabus Beetle.—Some larvæ forwarded from near Worcester were identified as those of a *Carabus* beetle, the grubs being carnivorous in diet, preying on insects that are sheltering or pupating in the soil. Most of the *Carabus* family are also carnivorous in the adult or beetle stage, but certain adult species of the genera *Pterostichus* and *Harpalus* are sometimes very troublesome among strawberries and have been known to injure mangolds.

Specimens of the Pea and Bean Weevil (*Sitones*) (see Leaflet No. 19) were forwarded from Bourne, Lincs., where crops of winter beans are said to have been completely ruined ; while the Clay-coloured Weevil, *Otiorrhynchus picipes*, has been found doing much damage near Dumfries, especially in nurseries. This weevil is dealt with in the Board's Leaflet No. 2. A species of *Otiorrhynchus* appears also to be damaging gooseberry bushes at Gilmerton, Midlothian.

Pine Beetle.—A Hampshire correspondent, who has followed the instructions given in Leaflet No. 91 against the Pine Beetle, *Hylesinus piniperda*, inquires what should be done in the case of living trees which have been attacked by the beetle. Unfortunately there is no actual remedial measure by which the brood can be reached and destroyed in standing trees. The larvæ tunnel between the wood and the bark and cannot be reached from the outside. Badly infested trees can only be treated as "trap trees," and care should be taken to fell and bark them before the brood of beetles has issued to lay the eggs for the next generation. Here and there among the healthy trees a pine should be felled and allowed to lie so as to attract egg-laying beetles. These trap pines should have their bark removed while the brood is in the grub or larval stage.

FLIES.—Specimens of chrysanthemums sent from Carnforth were found to be attacked by the Chrysanthemum Leaf Mining Fly (*Trypeta*). From the egg laid by the adult insect a larva hatches and proceeds to mine in the tissue

of the leaf between the upper and lower epidermis, making characteristic galleries. Once the maggot has got to work inside the leaves it cannot be reached by any spray. The infested leaves, therefore, should be pulled off and burned, or the maggots may be destroyed by pinching the leaf between finger and thumb. Various means have been tried in order to keep away the adults and deter them from egg-laying. Against a fly which attacks other plants in a similar way the following spray is known to act as a deterrent: 1 oz. bitter aloes and 2 oz. soft soap in 1 gallon of water.

Holly-leaf Miner.—Other leaf-mining insects were forwarded from Sunderland, these being the Holly-leaf Miner (*Chromatomyia ilicis*) and the Marguerite Fly (*Napomyia lateralis*). The former was destroying holly trees. The tiny black fly lays its eggs in June on the mid-rib on the under surface of the holly leaves, the maggot becoming full grown late in the next spring or early summer. The fly issues from the pupa-case, through a hole in the holly leaf, late in May or in June. During the latter month, when egg-laying is in progress, the hollies should be sprayed with paraffin emulsion or dusted with a mixture of equal parts of soot and lime. Infested leaves should be removed and burned.

The Marguerite Fly (*Napomyia lateralis*) like the last named insect, lays eggs from which come maggots that mine in the leaf. To prevent the trouble spreading, infested leaves should be removed and burned, or, in the case of a bad attack, the whole plants should be destroyed. The female is deterred from egg-laying if at an early stage the plants are sprayed with paraffin emulsion.

St. Mark's Fly.—A suspected case of Pear Midge from Hadleigh, Suffolk, turned out to be a fly of the family *Bibionidæ*, for the most part of the species *Bibio Marci*, or St. Mark's Fly. The flies of the genus *Bibio* appear as a rule early in the spring, and as they often occur in large swarms, are supposed to be very harmful, although in reality they are not so. The larvæ of some species are said to feed on the roots of grass, and the larvæ of a neighbouring genus, *Dilophus*, have been recorded as injurious to the roots of hops. In general, however, eggs are laid in decaying and decomposing matter, and the larvæ are scavengers. Notwithstanding the swarms which are seen about the blossoms

in orchards they do not appear to be of any help as agents in pollination.

Fever Fly.—From Slough the Board received specimens of the pupæ of the so-called Fever Fly, *Dilophus febrilis.* The flies vary in colour according to sex, the males being black and hairy, while the abdomen of the female is brown. There are two broods in the year, the summer brood issuing in June. Great swarms of the flies are common. The grubs live in the soil and have been reported as injurious to the roots of grasses and hops. They have been found in numbers, however, in horse and other manure, and as the family *Bibionidæ*, to which *Dilophus* belongs, is a family of scavengers, probably the real habit of the *Dilophus* grubs is to act in the same way. They could thus easily be conveyed to gardens in manure. If the grubs are known to be doing any harm they may be destroyed by injecting carbon bisulphide into the soil.

MITES.—Enlarged buds of nut trees sent from Welwyn were found to be infested with the Nut Bud Mite, *Eriophyes avellaena.* The operations of this mite are very similar to those of the Black Currant Gall Mite (*E. ribis*), and the treatment adopted should be the spray recommended for that pest in Leaflet No. 1.

Mites, &c., on Rhubarb.—Specimens of rhubarb forwarded from Leeds were infested by three distinct creatures, one of these being a mite belonging to the family *Trombidiidæ*, and, according to Mr. Albert B. Michael, our greatest authority on mites, probably to the genus *Ereynetes.* The family *Trombidiidæ* is, to a great extent, a predatory one. One section does affect plants, but the majority are not plant feeders but are carnivorous in diet and predaceous in habit. Mr. Michael believes that in the case quoted the mites were not injuring the rhubarb but were preying on small animal life in the soil.

Eelworms and Enchytraeid Worms.—In connection with the foregoing paragraph it will be convenient here to deal with the two remaining animals found in the rhubarb. In the rotting tissue eelworms were numerous. These pests are described in Leaflet No. 46, but, in the case under consideration, the remedial measure advised below for the *Enchytraeid* worms would probably render any further treatment against the eelworms unnecessary.

The third species of creature present was an *Enchytraeid*

worm, and it is probable that this is responsible for the damage done to the rhubarb. These worms, which are almost transparent, belong to the family of *Oligochoete* worms, to which the ordinary earthworm also belongs. The section of the family known as *Enchytraeidæ* numbers in it some fifty species, all small in size, none measuring more than one inch, this large size being exceptional. Some live on land and others are aquatic, while yet others can adapt themselves to both an aquatic and a terrestrial life. Certain species are parasitic on plants, and have on occasion proved very harmful. They can be introduced in composts of road-scrapings and decaying leaves. The worms live below the skin of the attacked plant and tunnel in the root and stem. The records chronicle attacks on celery, swedes, cabbage and a number of garden plants, the infested plants in many cases rotting away. In the matter of treatment it may be said :—(1) That lime has been used with advantage, the soil being watered with the water strained away after mixing quicklime and water in the proportion of 1 lb. to 1 gallon. (2) Theobald has recommended watering with a mixture of 1 oz. of corrosive sublimate to 6 gallons of water (corrosive sublimate is a dangerous poison, and used in the strength named is powerful enough to kill the ordinary earthworm). (3) Bisulphide of carbon injected in the soil would kill the worms, but the liquid might harm the plants if it reached them, and should therefore only be used in the case of infested road-scrapings, &c., before use. (4) In a case mentioned by Carpenter in Ireland a dressing of agricultural salt (1 ton to the acre) practically eliminated *Enchytraeid* worms.

Red Spider.—Specimens of gooseberry bushes infested with red spider have been received during the month from Maidstone, Bath, Chislehurst and Haslemere. This pest is dealt with in Leaflet No. 41.

APHIDES.—Green fly, aphides or plant lice on gooseberries were sent from Chislehurst, Haslemere, Isleworth and Westbury (Wilts); these insects are dealt with in Leaflet No. 104.

A correspondent in Liverpool inquired as to a remedy for black fly on beans. It may be remarked that the attack of bean aphides may be largely prevented or mitigated by pinching off the tops of the plants, which are the parts chiefly infested. This should be done early and the tops destroyed by burning or by covering them with lime.

Aphides on Willows were forwarded from Ormskirk, where they were present in great numbers on the shoots and were doing much damage. Drawing a gloved hand over the infested shoots would destroy them in hundreds. Infested willows might be sprayed with either of the following mixtures :—(1) 10 lb. of soft soap dissolved in 100 gallons of soft water and mixed with the extract obtained by boiling 8 lb. of quassia chips in water. As the spray will dislodge many of the insects the ground should be sprinkled with lime to prevent them re-ascending the trees. (2) Paraffin 2 gallons, water 1 gallon, soft soap $\frac{1}{2}$ lb. The soap should be dissolved in boiling water and the paraffin then added and the whole churned thoroughly. This "stock" emulsion should be diluted for use, in the proportion of 10 gallons of water to 1 gallon of "stock."

Aphides on Scotch Firs.—Another case of aphides submitted to the Board revealed the presence on Scotch firs of aphides of the genus *Lachnus*. By the aid of a pocket lens the long sucking tube which the insect drives into the plant tissue, thence drawing away the sap, can plainly be seen. These aphides may be destroyed by treatment with the soft soap wash or the paraffin emulsion recommended against aphides in Leaflet No. 104.

Other pests submitted for identification were the Apple Sucker (see Leaflet No. 16) from Newton Abbot, and Millipedes (see Leaflet No. 94) from Probus (Cornwall), where they were attacking several garden crops, and from Longniddry (Haddingtonshire), where they were severely damaging mangolds.

FUNGI.—Among the specimens infested with fungous diseases, rhubarb plants forwarded from Portobello, N.B., were attacked by the fungus *Rhizoctonia violacea*, Tul., causing root-rot. This disease is described in Leaflet No. 171. From Burton Joyce, Nottingham, a correspondent sent a spray of plum leaves infested with the disease known as "Silver Leaf," which was found both on wall and standard plum trees. Neither cause nor cure is known, but the addition of lime to the soil has been recommended. Branches that are attacked should be removed and burned, as they do not recover.

Shot-Hole Fungus.—Diseased peach leaves from Westbury, Wilts, were injured by the "Shot-hole" fungus, *Cercospora circumscissa*, Sacc. As a preventive measure spraying should

be done with an ammoniacal solution of carbonate of copper. This is prepared by dissolving 1 oz. of carbonate of copper and 5 oz. of carbonate of ammonia in about a quart of hot water, afterwards diluting with 16 gallons of water. Spraying should be commenced just when the leaves are expanding and be repeated three times at intervals of six days.

Plane Leaf-scorch.—An inquiry was received as to a cure for the disease known as Plane Leaf-scorch, *Gloeosporium nervisequum.* In the case of this fungus the leaves and shoots of the plane tree can only be infected during the very earliest stages of growth. To prevent infection spraying should be carried out when the leaf-buds are expanding, and again when new shoots are forming, with an ammoniacal solution of copper carbonate prepared according to the formula given above ("Shot-hole" Fungus). In the case of nursery stock, where the unsightliness produced is of less importance, half normal strength Bordeaux mixture (10 lb. sulphate of copper and 5 lb. of lime to 100 gallons of water) may be used. Where the disease has existed the dead leaves should be collected and burned, while shoots that have been attacked should also be removed and burned.

Finally, specimens of apple shoots from an orchard at Salisbury had been killed by the "Brown Rot" fungus, *Sclerotinia fructigena,* Schröt, described in Leaflet No. 86; bush fruit trees from Earl's Barton, Northampton, were suffering from "White Root Rot," dealt with in Leaflet No. 64; while a case of the potato disease, *Phytophthora infestans,* De Bary, was sent by a correspondent from Ottery St. Mary, Devon.

Destructive Insects and Pests Act, 1907.

The object of this Act, which came into force on the 4th of July, 1907, is to extend to all pests destructive to crops, trees or bushes the powers which may be exercised in Great Britain by the Board of Agriculture and Fisheries, and in Ireland by the Department of Agriculture and Technical Instruction for Ireland, under the Destructive Insects Act, 1877, in relation to the Colorado Beetle.

These powers and provisions as applied with modifications by the Act are :—

1. Power to make such Orders as the Board or Department think expedient for preventing the introduction of the pest.

2. Power to prohibit or regulate the landing of any vegetable substance or other article brought from any place out of Great Britain or Ireland, the landing whereof may appear to the Board or Department likely to introduce the pest, and to direct or authorise destruction of the article if landed.

3. Forfeiture by the Customs of articles illegally landed.

4. Power to make such Orders as the Board or Department think expedient for preventing the spreading of the pest.

5. Power to direct or authorise the removal or destruction of any crop, trees or bushes or other substance on which the pest in any state of existence is found, or to or by means of which the pest may appear to the Board or Department likely to spread, and the entering on any lands for the purposes of such destruction or removal, or for examination or inquiry, or any other purpose.

6. Power to prohibit the sale, &c., of specimens of the pest.

7. Power to impose penalties for offences against the Orders.

8. Power by Order, with the consent of a Local Authority, to direct or authorise payment by them of compensation for crops, trees or bushes removed or destroyed under an Order. The compensation is not to exceed half value for diseased crops, &c., nor three-quarter value for other crops.

9. The Local Authorities who may be required to carry the Orders into effect are the same as those under the Diseases of Animals Acts.

Clover Sickness.

This expression is used by farmers to describe the condition of a crop of clover, which up to a certain point has progressed satisfactorily, and then suddenly commences to die off in patches; in extreme cases the entire crop may disappear. The term is somewhat general in its application, and in reality covers the outcome of an attack by "eelworms" *Tylenchus devastatrix*, Kuhn, or by a fungus called *Sclerotinia trifoliorum*, Eriksson.

Some doubts have been expressed as to whether "eelworms" are a primary cause of "clover sickness." Absolute proof as to the primary cause of a given disease is by no means

an easy matter, and it is often practically impossible to refute the hypothetical predisposition clause so frequently advanced.

The arrival of an ample supply of clover attacked by "eel-worms" at Kew for investigation, furnished an opportunity for experiment. English red clover was used.

Experiment 1.—The surface of the soil in which a batch of seedlings was growing was sprinkled over with finely cut up clover containing eelworms. At the expiration of two months the stems of the plants were badly infected, and showed the characteristic swollen bases.

Experiment 2.—Full-grown plants were treated as in Experiment No. 1. No infection followed.

Experiment 3.—A layer of finely cut-up infected clover was placed at the bottom of a plant pot and covered with five inches of soil in which seedling clover was planted. No infection followed.

Experiment 4.—The surface of the soil in which a batch of seedlings was growing was covered with finely cut up infected clover, this again was sprinkled over with crushed sulphate of potash, at the rate of two ounces to the square yard (about 4 cwts. to the acre). No infection followed.

In a check experiment the plants were supplied with infected clover, but the application of sulphate omitted, the seedlings were infected, proving that in Experiment 4 the eelworms were killed by the sulphate of potash.

These experiments prove :—

(1) That eelworms can infect and kill otherwise healthy clover.

(2) That infection can only be effected during the seedling or quite young stage of clover.

(3) In the case of infected land, if the eelworms are buried to a depth of 5 in. in the ground, no infection takes place. This points to deep ploughing as a remedy.

(4) If a diseased crop is treated with sulphate of potash, at the rate of 4 cwts. per acre, the eelworms are destroyed.

Kainit has been recommended as a remedy, but as its sulphate constituent alone is of value for this purpose it would be necessary to apply about 1½ ton per acre, and at the prices now quoted kainit would be more expensive than sulphate of potash, and would not be so prompt in its action.

Clover attacked by eelworms is readily recognised by the branches being much swollen at the point where they spring from the crown; this character is well shown in the accompanying illustration (Fig. 1). If a very thin slice of a swollen branch is examined under a microscope, numerous colourless eelworms will be seen wriggling about like miniature eels, hence the popular name.

FIG. 1.—Typical illustration of "clover sickness."

In addition to clover, the stem-infesting eelworm attacks many other kinds of cultivated plants and also weeds; among others may be mentioned potatoes, strawberries, onions and oats. The last-named crop is often as badly attacked as clover, the disease being known among farmers as "segging" or "tulip-root," the latter name being in allusion to the much swollen base of the stem, which bears some resemblance to the bulb of a tulip (Fig. 2).

Oat plants that are attacked remain short and stunted, the base of the stem is swollen, and the ear does not escape from the sheath. As in the case of "clover sickness" the disease usually commences in isolated patches in different parts of a field. These patches gradually increase in size and encroach on each other, until finally the entire crop is destroyed. A small patch of oats was sown in soil that was sprinkled over with finely cut up clover infected with eelworms, and within nine weeks every oat plant was infected.

When onions are attacked, which only occurs during the young condition, the base of the stem becomes swollen and the leaves are more or less wrinkled and deformed. Further growth is checked.

Not infrequently an epidemic caused by eelworms suddenly appears for the first time in a field, or in a district where such disease had not previously occurred. Such unexpected outbreaks are explained when the varied methods by which eelworms may be conveyed from one place to another are taken into consideration. It has been proved that these organisms can pass through the alimentary canal of an animal without injury, hence if a hare or a rabbit eats infected clover the dung may be deposited at a considerable distance from the point where the food was obtained. Again, eelworms in the egg stage can survive a long period of desiccation, and being so very minute are blown from place to place in the form of dust, which on being washed to the ground by rain proves a source of danger. When soil is once infected there is always the danger of conveying the disease to adjoining land by soil adhering to tools, cart wheels, &c.

The annual loss in this country caused by eelworms is very considerable, but fortunately the remedy against such loss is thoroughly practicable and effective if promptly applied.

When a crop shows signs of disease, a dressing of sulphate of potash should be applied at once to the diseased patches, taking care to extend the dressing somewhat beyond the obviously diseased plants.

It may be taken for granted that land that has produced a diseased crop is infected, and as eelworms are able to live in the soil for some years, it is important that such land should be sterilised. This can be done most thoroughly by

using gas-lime. This should be allowed to lie on the surface for a month, and then lightly ploughed in. If gas-lime is not available, deep ploughing should be resorted to, as the eelworms are destroyed when deeply buried.

Diseased material should be removed, and although it may appear absurd to suggest that it should be burned or deeply

FIG. 2.—"Segged" or "tulip-rooted" oats.

buried, such are in reality the only certain means of preventing a repetition of the disease. The reason why it should not be used as food for animals has already been given, and if it is converted into manure the eelworms and their eggs are not destroyed, but returned to the land.

Black Rot of Cabbages, Turnips, &c.

This disease (*Pseudomonas campestris*, E. Smith) is very prevalent in the United States, and during recent years has occurred in various European countries. It is of bacterial origin and causes the plant to rot and form a pulpy fœtid-smelling mass. Cauliflowers, cabbages, Brussels sprouts, radishes, white and swede turnips—in fact all cultivated plants belonging to the Crucifer family are attacked. The lower leaves are usually infected first, the germs entering the substance of the leaf through minute openings (water stomata) situated along the margin, or through wounds caused by the punctures of insects, &c. In cases where the soil is infected the germs may gain an entrance to the plant through broken roots at the time of transplanting. When the bacteria are once inside the leaf they multiply rapidly and are confined to the veins, from whence they pass down the leaf-stalk into the stem. From the stem they quickly pass into the stalks of other leaves, so that within a short time every leaf is infected. As the bacteria travel along the veins and the vascular bundles of the leaf-stalks and stem a dark brown or blackish substance is deposited, which causes the veins to show up as a black network ; the vascular bundles of the leaf stalk and the stem also appear as black points or a blackened ring when cut across. The presence of this blackening of the veins is a certain indication of the presence of the disease, and infected plants should be promptly removed and burned—not buried nor used as food for cattle or pigs, otherwise the result will be infection of the land sooner or later. It has also been proved that the germs are conveyed from diseased to healthy plants by insects. Rotation of crops is advisable ; cereals, potatoes, and legumes are not attacked In this country rape appears to be most susceptible to the disease. In an extensive trial plot of various kinds of cabbages, savoys, Brussels sprouts, &c., those that contained "rape blood" were first attacked, whereas those strains without a taint of rape were the last to succumb.

It has been considered by growers that the disease can be transmitted by means of the seed, and this idea has been proved to be correct by Harding, Steward, and Prucha, who have shown that in the United States much of the cabbage seed offered for sale is contaminated with the germs of black rot disease.

The following precautionary measure is suggested. All cabbage seed should be disinfected before sowing, by soaking for 15 minutes in a solution consisting of one part of corrosive sublimate in 1,000 parts of water, or in formalin, 1 lb. to 30 gallons

CROSS SECTION OF CABBAGE STEM, SHOWING BLACKENED VASCULAR BUNDLES.

of water. It is not expected that this treatment will prevent either leaf or root infection in infected soils, but it may be safely relied upon to prevent all danger from infected seed. It will not injure the germination.

Plant Import Regulations.*

Cape Colony.—In connection with the importation of plants into Cape Colony, revised over-sea plant import regulations were published as Proclamation 502, 1906, on 25th December last. By mutual arrangement the Orange River Colony, Transvaal, Natal and Rhodesia have published, or are about to publish, similar regulations. The new Cape schedule is, in most respects, identical with the one which it supersedes, but certain modifications have been made with the view of securing greater efficiency, and also uniformity with the regulations of the other Colonies. No person may introduce any tree, plant, or portion thereof,

* Previous notes as to plant import regulations have appeared in this *Journal* as follows :—Germany, September, 1903 ; Cape Colony, October, 1904 (now superseded) : Transvaal, February, 1905 (now superseded by similar regulations to those for Cape Colony) ; New Zealand, August, 1904, and June, 1906 ; Natal, September, 1905 (now superseded), and November, 1906 : Western Australia, June, 1906 ; and Rhodesia, October, 1906.

such as cuttings, roots, tubers, bulbs, seeds or fruit, otherwise than by post, or through one of the following seaports, namely: Beira, Lourenço Marques, Durban, East London, Port Elizabeth, Mossell Bay and Cape Town, save by special authority from the Secretary for Agriculture.

Among articles forbidden entry are any eucalyptus, acacia or coniferous plant, or any living portion thereof, with the exception of seed; any stone fruit tree or any living portion thereof, which was grown in any portion of North America in which either of the diseases known as Peach Yellows or Peach Rosette exists; also fresh grapes and live peach stones.

All stocks are prohibited, except pear, plum, apricot, cherry, mango, persimmon and apple accepted by the Secretary for Agriculture as being resistant to the attack of Woolly Aphis (*Schizoneura lanigera*).

Other clauses deal with grape vines, sugar canes, trees and fruit bearing plants, &c., and the introduction of plants by special permission.

An explanatory memorandum on the Proclamation is published in *The Agricultural Journal of the Cape of Good Hope* (January, 1907), which may be seen at the Offices of the Board.

Argentina.—The Board are informed through the Foreign Office that bulbs, tubers and roots imported into Argentina are subject to the regulations contained in a Decree of August, 1902, which requires (Article 9) that bulbs and stems shall be stripped of all their scales and dead coverings as well as of earth, and undergo an antiseptic washing before they can be admitted. Tubers and roots are only to be admitted when they are free from earth and are recognized as being in a healthy condition, otherwise they must be washed or be submitted to the action of antiseptic vapour. The importer must apply on a printed form to the Head of the Agricultural Bureau, Buenos Ayres, for the articles to be inspected and must furnish particulars of country of origin and other details. Certificates issued in the country of exportation to the effect that the tubers, &c., are free from disease are not now required by the regulations, but it may tend to facilitate the passing of consignments through the Custom House if the tubers are accompanied by such certificates viséd by an Argentine Consul.

Green Manuring.

Green manuring or the ploughing under of green crops is one of the oldest methods used to maintain or to increase the productivity of the soil. The effect varies with the character of the soil; sandy or gravelly soils are made darker in colour and become more retentive of moisture, while clayey soils are made more porous and friable. The most important object achieved by green manuring is the addition of humus to the soil, and, other things being equal, the best green manure crop is that which furnishes the largest amount of material which will readily decay in the soil and thus form humus. There are, however, additional ways in which such a crop may be beneficial. Deep-rooted plants are decidedly preferable to shallow-rooted ones because they penetrate into the sub-soil and thus admit air and water. Leguminous plants also are more valuable for green manuring, because they not only provide humus but also collect nitrogen from the air, which is thus added to the soil.

Green manuring as a definite farm practice can only be recommended under certain conditions. It is very advantageous in improving the physical condition of sandy soils, and for this reason it has become a very common practice in Germany where large areas of light soil exist. It was, in fact, the success obtained by M. Schultz at Lupitz, in Saxony, in green manuring light sandy soil with lupins that first directed attention to the value of leguminous crops as a means of adding nitrogen to the soil.* There is not so much evidence of its value on medium and heavy clay soils, though several German agriculturists appear to have practised it with success for many years. Generally speaking, it cannot be recommended on good soils unless there is reason to believe that more humus is required, but where clover or some similar crop is used in rotation it is seldom necessary.

With regard to the crops employed for the purpose, leguminous plants are unhesitatingly recommended by practically all authorities both in Germany and the United States. In this country rape, mustard, &c., are still employed, and in experiments carried out for a number of years at Woburn by the Royal Agricultural Society, these crops have given

* See "Green Manuring," *Journal*, Vol. xii., p. 29, April, 1905.

better results than tares when followed by wheat and barley. Tares are a leguminous crop, and, according to analysis, added more than twice as much nitrogen to the soil as did the mustard or rape. Nevertheless the highest produce was in 1906, as in several previous years, obtained from green manuring with mustard and rape, which yielded on the average 10 bushels more wheat than did the tares, in spite of the extra manuring which the latter crop supplied. In the report on the experiments,* it is observed that "this result affords a thorough confirmation of the results obtained in former years, and leaves for solution a very interesting question, viz.: What is the cause of the apparent disappearance or, at least, the non-working of the nitrogen, whereby a result is obtained in practice which is so different from that which theoretical considerations would lead one to expect?" Apparently somewhat similar results have been obtained with these grains in the United States, as in speaking of suitable crops to follow green leguminous manuring, it is observed in Farmers' Bulletin No. 278, that "wheat and barley give varying results, often very favourable, but not infrequently there is no increase or even a loss." In Germany, too, this form of manuring is regarded as most advantageous to hoed crops, particularly roots, and also for oats, but as less suitable for wheat and barley.

Among the crops used for this purpose are various kinds of beans, peas, vetches, lupins and clovers. Serradella is a very favourite crop in Germany for this purpose.

An objection to the practice of green manuring lies in the fact that to a greater or less extent the crop occupies the land for a time without bringing in any return, and there can be little doubt that except in special cases it is better, where possible, to give the green crop to stock and distribute the manure over the land.

Early Matured Cattle.

During recent years there has been a steady advance in the demand for early matured cattle in the United States, and at the present time what is called "baby beef" has a firm hold on the market as supplying the very best class of meat. "Baby beef" may be defined as a prime butchers' beast, thoroughly fattened and ripe for

* *Journal of Royal Agricultural Society*, 1906, p. 300.

the block at from twelve to twenty-four months of age, whose growth has been artificially promoted by continuous heavy feeding from birth, with the object of obtaining in the shortest time possible the maximum amount of well-matured beef. It is this continuous heavy feeding from birth which distinguishes this class of meat from cattle which are merely fattened for four to six months just before slaughter. The principal advantages to be derived from the production of these early matured cattle are (1) the quick returns on the capital they represent; (2) the greater demand and better prices; and (3) the greater amount of meat produced per pound of food consumed. The United States Department of Agriculture have recently issued a bulletin (Circ., No. 105, Bureau of Animal Industry) on this subject, in which it is stated that early maturity is not so much a matter of breed as of type. Early maturity is generally found in animals that combine a good feeding and assimilative capacity with a certain fineness of quality. Each of the various beef breeds offers more or less diversity in this respect, some individuals in each conforming more closely to this type than others of the same breed. While early maturity is not entirely a matter of size, it is most often found in individuals a little smaller than the average of the breed. Good specimens have a compact form, fine bone, soft, pliable skin and good digestive capacity, the latter being indicated by well-sprung ribs, great depth of body and wide chest.

With regard to feeding, it must be remembered that a calf cannot utilize coarse fodder to any extent during the first six months of its life, so that its food must be confined to milk and grain. Young calves which receive liberal quantities of whole milk make rapid gains and get very fat, and this fat is, on the whole, very economically produced, whereas calves that are allowed to get thin during the first six months of their lives generally require a long time to get over the check. Where early maturity is desired such a system would be disastrous, and the fattening should begin with whole milk at birth and be continued until the animal is mature and ripe for the block. It has been found most satisfactory to permit them to run with their dams from four to six months. As the digestive system develops and solid food becomes necessary, grain should be added, the quantity being gradually increased so that when

weaning time comes the change is less sudden, and a check in growth or a loss in flesh is less likely to occur.

An alternative system is to allow the calf to run with the cow for several weeks, after which they are separated, the calf being allowed to suck three times daily and the cow stripped after the calf has had its fill. This permits a more gradual transition at weaning time, as one of the suckings may be discontinued when the calf is about three months old, another when it is about five months old, and the third when it is six months old, by which time the calf will have become accustomed to eat grain and to drink water. The calf can also be fed with whole milk from the pail.

The fact that the best results are generally obtained with whole-milk calves does not eliminate skim-milk calves from the range of possibility for early matured beef, linseed meal or some similar substitute being used to replace the fat removed from the milk. Calves thus fed tend to grow in frame rather than to fatten, and they generally require from four to six months longer to acquire the same degree of finish.

The calf should be so thoroughly accustomed to the use of grain when weaning time comes that milk can be discontinued without any check to growth. From this point the key to the successful production of early matured beef is to hold the flesh already gained and to continue its rapid and steady growth. The method of feeding adopted to obtain such results will depend largely upon the nature of the feeds available and the season of the year. In any case the feeding of young stock requires much more care and attention than is necessary with older cattle. They are much more subject to irregularities of the digestive system, and these are especially liable to follow the feeding of very heavy rations when it is done carelessly. To induce calves to eat the greatest possible amount and yet keep their appetite keen it is necessary to feed them regularly at stated times every day, as stock will become accustomed to eat at certain hours and will often come to the trough at that time through force of habit, though they may not be particularly hungry. They should be fed more frequently than those nearly mature in age. The grain should be given in two or three feeds daily. If it is given mixed with chopped fodder, it is probably better to give three meals daily,

but if kept on pasture two meals of grain is probably sufficient after the first six or eight months. Water and salt should be accessible at all times.

The above observations, which are taken from the United States publication referred to, may be read with the suggestions as to feeding made in the Board's Leaflet, No. 79 (Rations for Farm Stock), which states that yearling bullocks intended to be house-fed for early beef of, say, about 8 cwt. live weight at about nineteen months old, should have the diet recommended for calves rising a year old, that is about 1 to 1½ lb. of mixed linseed cake and meal, 4 lb. or more of hay and 3 to 10 lb. of swedes (or grass in summer). This may be steadily increased, until they finish with two-thirds of the ration of a full-milking shorthorn cow. At about fifteen months old the fattening yearling would in this way be receiving a diet like No. 1; and at eighteen or twenty months of age, when finishing for the butcher, a ration like No. 2 would be suitable. The albuminoid ratio in both cases is about 1 to 5.

No. 1.		No. 2.	
21 lb.	Swedes.	37 lb.	Swedes.
7 ,,	Hay.	10 ,,	Oat Straw.
2 ,,	Oats.	3 ,,	Maize, Barley, or Wheat.
3 ,,	Linseed Cake.	3 ,,	Linseed Cake.
		2 ,,	Decorticated Cotton Cake.

Yearling store bullocks and heifers turned out to grass in the spring require no extra food, but should come in full of flesh in late autumn. For wintering yearling stores a liberal allowance of turnips and straw, with from 2 to 4 lb. per day each, according to size, of mixed decorticated cotton cake and meal, should be given in order to produce well-grown and "fresh" beasts for the spring store sales. If, however, they are intended for the fat market in the new year, when close upon two years old, they will require more liberal feeding, and by the beginning of December will pay for a ration of five-sixths that of a cow in full milk, such as :—

No. 3.		No. 4.		No. 5.	
42 lb.	Swedes.	42 lb.	Cabbages or Yellow Turnips.	22 lb.	Mangolds.
14 ,,	Oat Straw.	7 ,,	Hay.	18 ,,	Oat Straw.
3 ,,	Maize, Meal or 4 lb. Crushed Barley or Rice Meal.	6 ,,	Straw.	4 ,,	Crushed Oats.
4 ,,	Decorticated Cotton Cake or 5 lb. Linseed Cake.	4 ,,	Crushed Oats.	4½ ,,	Decorticated Cotton Cake.
		6 ,,	Dried Grains		
			or	3 lb.	Crushed Oats.
				5 ,,	Dried Grains.
				¼ ,,	Linseed.

Leaflet No. 142 (Calf Rearing) also contains suggestions as to feeding calves.

Orders of the Board under the Diseases of Animals Acts.

A brief indication of the principal Orders of the Board which affect the more general movement of animals, in connection with swine fever and sheep scab, is given below. Copies of the Orders may be obtained by persons interested from the local authorities of the respective districts, but it should always be borne in mind that owing to the fluctuation of disease in any particular district, the provisions of the Orders may have been varied, or other Orders may have been made, since the date of issue of the Orders herein mentioned.

Swine Fever.—The Swine Fever (Regulation of Movement) Order of 1903 regulates the movement of swine *into* each area to which it applies and restricts such movement to (*a*) swine moved to bacon factories, slaughter houses or specially authorised lairs, markets and sale yards, and (*b*) cases in which the swine have been on the same premises for at least twenty-eight days before movement. In the latter case the swine must be detained for a further period of twenty-eight days on the premises to which they are moved. In every case of movement into the area a licence is required, granted by the local authority of the district in which the place of destination is situate.

Special provision is made for movement between two areas.

The Order applied on the 1st July to areas comprising :—Aberdeenshire, Argyllshire, Banffshire, Bute, Caithness, Clackmannan, Elgin, Fife, Forfarshire, Inverness-shire, Kincardineshire, Kinross, Nairn, Orkney, Perthshire, Ross and Cromarty, Stirlingshire, Sutherland, and Zetland ; Anglesey, Carnarvonshire, Denbighshire, Flintshire, Merionethshire, and Montgomeryshire ; Ayrshire, Bedfordshire and Hertfordshire ; Berkshire*, Buckinghamshire*, Middlesex*, and Oxfordshire ; Berwickshire, Roxburghshire, and Selkirkshire ; Breconshire, Cardiganshire, Carmarthenshire, Glamorgan, Monmouthshire*, Pembrokeshire, and Radnorshire; Cambridgeshire ; Cornwall, Devonshire, and Somersetshire* ; Cumberland, Lancashire, and Westmorland ; Derbyshire*, Nottinghamshire* ; Dorset-

* See list (on the next page) of areas scheduled under the Swine Fever (Infected Areas) Order of 1902.

shire†; Dumbartonshire, Lanarkshire, Peebles, and Renfrew; Dumfries-shire and Kircudbrightshire; Durham and Yorkshire (North Riding); Essex*; Haddingtonshire; Hampshire* and Isle of Wight; Huntingdonshire, Isle of Ely, and Soke of Peterborough; Leicestershire‡, Lincolnshire*, and Rutland; Linlithgow and Midlothian; Norfolk*; Northamptonshire; Sussex (East* and West); Wigtownshire; Wiltshire†, Yorkshire (East and West Ridings).

The Swine Fever (Infected Areas) Order of 1902 regulates the movement of swine along, over, or across a highway or thoroughfare in swine fever infected areas, *i.e.*, areas to which the Order applies. In every case the swine must be accompanied by a Movement Licence of the Local Authority of the district in which the swine are when the licence is granted. Where the swine are to be moved from farm premises which are within an infected area, a licence cannot be granted unless the swine have been on the same premises for at least twenty-eight days, and no other pig has been brought on to those premises within such period. No public market, fair, sale, or exhibition of swine can be held in a swine fever infected area.

The Order applied on the 1st July to areas in :—Derbyshire and Notts (Mansfield district); Lincolnshire (Market Rasen and Lincoln districts); Monmouthshire (Newport district).

The Order, in a modified form to allow of markets, &c., to be held by licence of the local authority, also applied on the 1st July to areas in :—Berkshire (whole county); Bucks (High Wycombe district); Essex (practically the whole county); Hampshire (whole county); Middlesex (whole county); Norfolk (Norwich district); Somersetshire (whole county); East Suffolk (Lowestoft and Ipswich districts); Sussex (Brighton district).

Sheep Scab.—Orders requiring the compulsory dipping of sheep are in force throughout the whole of Great Britain, and also throughout Ireland.

The Sheep Dipping (England) Order of 1907 applies to the whole of England, excepting certain northern counties, Norfolk, and Monmouthshire—which are included in other dipping areas

* See list of areas scheduled under the Swine Fever (Infected Areas) Order of 1902.

† Certain restrictions are in force on the movement of swine within this county.

‡ Certain restrictions are in force on the movement of swine out of this county.

—and provides for the annual dipping of all sheep (with certain exceptions) during the prescribed dipping period, which commences on the 15th May and terminates on the 31st August, and also for dipping after introduction into the area or exposure at markets at any time during the dipping period.

The Sheep Dipping (Scotland and North of England) Order of 1907 applies to the whole of Scotland and also to the counties of Cumberland, Durham, Lancashire, Northumberland, Westmorland, and the North and West Ridings of Yorkshire. It provides for two annual dippings of all sheep (with certain exceptions), the first dipping period commencing on 1st January and terminating on the 31st August, and the second dipping period commencing on the 1st September and terminating on the 12th November.

Provision is made for restricting exposure for sale in the area, and movement out of the area during the second dipping period, to sheep that have been dipped within a certain period. In Norfolk, a similar Order is in force, but with a second dipping period expiring on the 11th October.

The Sheep Dipping (Wales and Monmouth) Order of 1907 applies to Monmouthshire and to Wales—excepting the counties or parts of the counties of Anglesey, Cardigan, Carnarvon, Denbigh, Flint, Merioneth, and Montgomery, wherein the more stringent Sheep Scab (Compulsory Dipping Areas) Order of 1906 is in force. The Sheep Dipping (Wales and Monmouth) Order of 1907 provides for the annual dipping of all sheep (with certain exceptions) within a period commencing on the 1st August and terminating on the 15th September.

Provision is made for restricting exposure for sale in the area, and movement out of the area to sheep that have been dipped within a certain period.

The Sheep Scab (Compulsory Dipping Areas) Order of 1906 has been applied to certain compulsory dipping areas, comprising the counties or parts of the counties of Anglesey, Cardigan, Carnarvon, Denbigh, Flint, Merioneth, and Montgomery. The Order requires compulsory dipping of all sheep in the dipping area within a time which is prescribed by Order for each area, and regulates the exposure of sheep at markets in the area and the movement of sheep out of the area.

Live Stock Import Regulations.*

Norway.—The regulations, dated June 20, 1904, which are now in force relating to the importation of domestic animals into Norway, provide that horses may be imported from countries other than Sweden (for which special rules exist) on condition (*a*) that every animal is accompanied by a certificate of health endorsed either by the police of the country from which the animal is sent, or by a Norwegian consul, certifying that the animal is healthy and cannot be supposed to carry infection; (*b*) that every animal, on its arrival at the Norwegian customs, is examined by an authorised Norwegian veterinary surgeon and is by him declared to be healthy. The importation of ruminants and swine is prohibited from all countries, except Sweden as regards ruminants. Dogs may be imported from Denmark and Sweden only on certain conditions. It is forbidden to import from any country raw portions of ruminants and swine; unprepared hides and skins (unless dried and salted); hair and bristles which have not been manufactured, prepared, or cleaned; and snouts or hoofs. Stable utensils which have been used are similarly forbidden, unless it is proved that they have been properly disinfected. Unsalted or unprepared meat or pork and unmelted fat may not be imported from Austria, Italy, Greece, Turkey, Russia, or any extra-European country. Grass, hay, and straw for fodder may only be imported from Sweden and Denmark.

Sweden.—The Swedish Government has recently notified that the importation of live stock by sea is sanctioned at the ports of Gothenburg, Helsingborg, Hernösand, Landskrona, Lulea, Malmö, Stockholm, Sundsvall, Söderham, and Umea. The importation of ruminants and swine is prohibited from any

* Live-stock import regulations have been published in this *Journal* for the following countries:—United States, June, 1903, and Sept., 1906; Argentina, Jan., 1905, April, 1905, Oct., 1905, and June, 1906; New South Wales, April, 1905; Germany, May, 1905; New Zealand, June, 1905; South Australia, July, 1905; France, Aug., 1905; Belgium, Sept., 1905; Uruguay, Oct., 1905; Victoria, Nov., 1905; Spain, Dec., 1905; Queensland, Jan., 1906; Western Australia, Feb., 1906; Tasmania, March, 1906; Transvaal, June, 1906; Ceylon, Cape Colony, Sept., 1906; Holland, Malta, Oct., 1906; Natal, Austria-Hungary, Nov., 1906; Russia, Hungary, Dec., 1906; Iceland, Italy, India, Feb., 1907; Isle of Man (sheep), Ireland, March, 1907; Canada, Isle of Man (swine), Jamaica, April, 1907.

country where foot-and-mouth disease exists. As regards non-infected countries the importation is prohibited of any animal which arrives in a vessel which has on board, or has had during the voyage, any suspected or infected animal, or any animal from an infected place. This prohibition also applies to animals brought in a vessel which during the preceding thirty days has had any such suspected or infected animals on board unless such vessel has since been disinfected. The landing is also prohibited of any animal which, during the two months immediately preceding its transportation or during transit, has been in contact with any place declared to be infected with foot-and-mouth disease or with any suspected or infected animal coming from such infected place. Animals may not be landed until a declaration to this effect has been furnished by the owner. Every animal is inspected before disembarkation by the official veterinary surgeon of the port or place and, if there is no reason to the contrary, the animal may be landed, but it must be detained in quarantine for twenty-four hours under the charge of the official veterinary surgeon. If symptoms of foot-and-mouth disease are detected the animal is immediately slaughtered.

Isle of Man.—The regulations* relating to the importation of sheep have been modified by a proclamation, dated 4th June, 1907, to the following effect :—

Persons desiring to import from the United Kingdom sheep intended for slaughter, must, before importation, give at least twelve hours' notice to the Chief Constable of the island, and to John Q. Cannell, C.P., of Ballacarnane, Michael, Isle of Man, the duly appointed inspector of scab, indicating the intended port of landing and the boat by which it is proposed to import them. A certificate from the veterinary inspector of the cattle market at which the sheep have been purchased, or from the Government Veterinary Inspector at the port of embarkation, that the animals are, free from scab, must accompany each consignment. No sheep will be landed unless such certificate is produced to the Inspector of Scab or to any officer of police. The animals must be slaughtered within fourteen days from the date of landing.

* See *Journal of the Board of Agriculture*, March, 1907, p. 742.

The Home Wool Buyers' Association have issued the following suggestions to wool growers on the preparation of wools for the market.

Preparation of Wool for Market.*

Washing.—Sheep to be carefully washed, and clipped within 10 or 12 days after washing, otherwise the wool cannot fairly be sold as washed. Sheep should be properly dagged before washing, as the manure not only discolours the water but damages the fleece.

Clipped when Dry.—Sheep to be thoroughly dry before being clipped, as wool clipped in a damp state quickly deteriorates in appearance and value.

Clipping Yard.—The yard or shed where clipping takes place to be kept as clean as possible. Every care should be used to keep the wool free from grass, straw or vegetable matter.

Winding Wool.—The fleece to be neatly wound (no string or twine should be used). All daggings to be taken off. Locks and broken wool to be packed separately.

Dip.—No dip which discolours the wool should be used.

Branding.—The sheep to be branded in such a manner that little of the marking remains when fleece is clipped. All parts affected by tar and composition have to be clipped off before the wool can be used, these being of little value. The Association recommends all sheep to be marked with a mixture that is soluble in hot water, and whenever possible on the head.

Storing.—It is very important that wool should be stored in a dry place, and kept as clean as possible. No grain should be near the wool as it is often carried into the pile by vermin.

Weighing.—No reliance can be placed on the weights of wool weighed in bulk at the railway stations.

The Association recommends that wool should be weighed in some more reliable manner. The railway companies only weigh for traffic purposes and do not guarantee correct weight between buyer and seller.

---

* See also *Journal*, Vol. xiii., No. 5, August, 1906, p. 293, Vol. xiv., No. 2, May, 1907, p. 96, and Leaflet No. 82.

Composition of Various Farm Foods.

The data given on the next page are published by the Agricultural Department of the University of Leeds. They have been compiled by Dr. Charles Crowther from various sources and refer, in all cases, to foods of average quality.

Committee on Distemper in Dogs.

The President of the Board of Agriculture and Fisheries, by a minute dated 22nd June, 1907, has appointed a Committee to enquire into the nature of distemper in dogs in Great Britain and the methods of its infection, and to report whether any, and if so, what preventive or remedial measures, exclusive of ordinary medical treatment, can with advantage be taken with respect to it.

The Committee is constituted as follows:—The Duke of Beaufort, The Lord Middleton, The Lord Leconfield, Sir John McFadyean, M.B., B.Sc., M.R.C.V.S., Mr. Edward Barclay, Mr. Stewart Stockman, M.R.C.V.S., Chief Veterinary Officer to the Board of Agriculture and Fisheries, and Mr. William Musgrave Wroughton.

The Chairman of the Committee will be The Lord Middleton, and Mr. James Ralph Jackson, M.R.C.V.S., Veterinary Inspector, Board of Agriculture and Fisheries, 4, Whitehall Place, S.W., will be secretary.

The cost of the enquiry will be defrayed by subscription and guarantees, and no charge in respect of it will fall upon public funds.

Notes on the Weather and the Crops in June.

It is, perhaps, hardly necessary to state that the weather during June has been exceedingly ungenial. During the *last* week of *May* it was cold, dull and unsettled, the warmth being "deficient" throughout England, except in the south-west. Rainfall was "heavy" everywhere, except in England N.E., where it was "very heavy," while sunshine was universally "very scanty," except in Scotland, where it was merely "scanty." With this week the Spring of 1907 came to a close. On making a comparison with last year it appears that the most characteristic feature has been the number of weeks of "heavy" rain in the midland and eastern parts of England. In Scotland the position is reversed, the number of weeks of "heavy" rain being fewer this year than last.

The summer began in a most unpropitious manner. During the *first* week of *June* bright sunshine was less than the average over all parts of the kingdom, the percentage of possible duration being only 8 in England N.W., and 13 in Scotland N. Rainfall was generally less than the average, but in the north and west considerably above, and several thunderstorms occurred.

Food.	Total Percentage in Food.					Digestible Percentage in Food.			Albuminoid Ratio in Digestible Matter.	Probable Value of Manure Produced by Consumption of one ton of the Food (allowing half the Nitrogen, three-quarters of the Phosphoric Acid, and the whole of the Potash) (Hall and Voelcker).*		
	Total Dry Matter.	Crude Albuminoid.	Oil.	Carbohydrate.	Fibre.	True Albuminoid.	Oil.	Carbohydrate and Fibre.		£	s.	d.
Cotton cake—decort....	92	43	10	24	6	36	9½	18	1 : 1¼	2	16	5
,, ,, undecort.	88	22	5½	30	25	16	5	19	2	1	13	9
Linseed cake	88	30	10	35	9	24	9½	33	2¼	1	18	7
Rape cake	90	30	10	29	11	20	8	24	2¼	2	1	1
Earthnut cake	89	46	10	23	5	40	9½	21	1¼	*2*	*10*	*9*
Cocoanut cake... ...	89	22	10	36	15	17	9½	39	3¾	1	11	6
Palm-nut cake... ...	90	17	10	36	22	14	9½	44	4¾	0	19	8
Linseed	91	23	36	23	6	17	35	20	6¼	1	10	6
Locust beans	85	7	1	69	7	4	½	70	18	0	12	2
Wheat middlings (fine pollard)	88	15	3½	62	5	12	3	56	5¼	*1*	*2*	*0*
Wheat sharps (coarse pollards)	88	15	4½	57	8	12	4	53	5	*1*	*3*	*8*
Wheat bran	87	14	4	56	9	10	3	45	5¼	1	8	11
Oatmeal	90	15	7	60	3	10	6	48	6¼	*1*	*4*	*9*
Maize germ meal ...	88	13	10	55	5	9	9½	52	8½	*0*	*16*	*5*
Gluten meal	89	35	4	45	2	30	3½	42	1¾	*1*	*11*	*1*
,, feed	90	26	3	52	6	21	2½	49	2¾	*1*	*5*	*6*
Rice meal	90	12	12	48	8	6	10	42	11	0	14	3
Malt	92	9½	2½	68	8	6	2	63	11¼	0	15	2
,, dust	90	23½	2	44	12½	12½	1½	39	3½	1	15	11
Brewers' grains (wet)	24	5	1½	10	5	3½	1¼	8	3	0	6	0
,, ,, (dried)	90	20	7	42	16	14	6	33	3½	1	4	3
Treacle	78	10	—	60	—	—	—	55	—	*1*	*10*	*3*
Meat meal	89	72	13	—	—	67	12½	—	½	*3*	*11*	*10*
Wheat	87	12	2	69	2	9	1¼	65	7½	0	14	10
Barley	86	10	2	67	5	7	1¾	64	9¾	0	13	9
Oats	87	11	5	57	10	8	4¼	47	7¼	0	15	5
Rye	87	11½	2	70	2	9	1	65	7½	*0*	*15*	*1*
Maize	89	10½	5	70	2	7	4½	68	11¼	0	13	0
Beans	86	25	1½	48	7	19	1¼	48	2¾	1	11	8
Peas	86	22½	1½	54	6	17	1	53	3¼	1	7	4
Straw—Wheat ...	86	3	1¼	37	40	¼	½	34	71	0	6	5
,, Barley ...	86	3½	1½	38	38	½	½	40	83	0	6	9
,, Oat	86	3½	2	38	37	1	½	37	38	0	7	7
,, Rye	86	3	1¼	33	44	½	½	35	73	*0*	*7*	*0*
,, Bean	82	8	1	31	36	3¼	¾	32	10½	*0*	*18*	*2*
,, Pea	86	9	1½	34	36	3½	¾	32	9¾	*0*	*9*	*0*
Meadow hay	86	10	2½	42	26	4	1	41	11	0	16	4
Clover hay	84	13	2½	37	25	5	1½	37	8	1	1	9
Pasture grass	20	3	¾	10	5	1½	½	11	8¼	*0*	*5*	*2*
Clover (green)	19	3½	¾	8	5	2	½	9	5¼	*0*	*5*	*6*
Vetches	16	3½	½	6	5	2	¼	7	4	*0*	*6*	*5*
Lucerne...	24	4½	¾	9	7	2	½	9	5¼	*0*	*6*	*2*
Cabbage	15	2½	¾	7	2	1½	½	7	5½	*0*	*3*	*10*
Rape	14	2¾	¾	6	3	1½	½	6	5	*0*	*4*	*4*
Turnip tops	12	2	½	5	2	½	¼	5	11½	*0*	*3*	*5*
Turnips...	9½	1	1/10	6	1	¼	1/10	6	25	0	2	4
Swedes	11½	1½	1/10	8	1½	¼	1/10	8	33	0	2	6
Mangels	12	1¼	1/10	9	1	1/10	1/10	9	92	0	3	1
Carrots	13	1¼	¼	9½	1½	½	1/10	10	21	*0*	*2*	*9*
Sugar beet	25	1¼	1/10	20	2	¼	1/10	20	81	*0*	*3*	*5*
Potatoes	25	2	1/10	21	¾	1/10	1/10	19	192	*0*	*4*	*7*
Milk—Cow (whole) ...	12½	3½	3¾	4¾	—	3¼	3¾	4¾	4¼		—	
,, ,, (skim) ...	9½	3½	¾	4½	—	3¼	¾	4½	2		—	
,, ,, (separated)	9	3¾	1/10	5	—	3½	1/10	5	1½		—	
,, Ewe	20	6½	8	5	—	6	8	5	4		—	
,, Mare	9	2	1¼	5¾	—	1¾	1¼	5¾	5		—	
Whey	7	1	¼	5	—	1	¼	5	5½		—	

* In calculating these Manurial Values the "unit" prices employed were:—Nitrogen = 12/-. Phosphoric Acid = 3/-. Potash = 4/-. The data in italics are not included in Hall and Voelcker's table.

During the *second* week the general condition was again very unsettled. Warmth was "unusual" in England E. and N.E., but the rainfall was "heavy" in the N.E. In the western section of the United Kingdom sunshine was "scanty" or "very scanty," with "heavy" or "very heavy" rainfall. The eastern section, as a rule, recorded "moderate" sunshine. The wind during the week was fresh to stormy.

The weather remained in a very unsettled state in all the more western and northern districts during the *third* week, with frequent and in some cases heavy falls of rain. In the east and south of England, however, it was finer and drier than for some time past. The temperature was, however, everywhere below the average. In the eastern section of the United Kingdom the warmth was "deficient" with one exception, and in the whole of the western section and in England S. it was "very deficient." Frost was experienced at some of the northern stations.

It was again cold and unseasonable in the fourth week of June, with a generally cloudy sky and frequent falls of rain. Thunderstorms occurred in many places, sometimes of great severity. Hail fell in several quarters, and on one occasion snow fell in Harrogate. Rainfall was above the average in most districts, the excess being large in many parts of the kingdom. The warmth recorded was "deficient" in England E. and N.E. In every other district it was "very deficient." Sunshine was "scanty" in England E. and midland counties, and "very scanty" in England S. and S.W. The wind was fresh or strong in the southern and south-western district, and on one occasion reached the force of a gale. Frost was registered in several places on the grass.

In view of the foregoing cheerless record it is noteworthy that none of the Board's correspondents have sounded a pessimistic note in regard to the crop and fruit prospects. In northern Lancashire it is recorded that the continued heavy rains and lack of warmth have now definitely made the season backward. On some farms potatoes are yet to be planted, the garden crops are a fortnight late, and no strawberries had been picked by the end of the month. No grass had been cut at the date of writing. In exposed positions there had been some mortality among the lambs. In Berkshire, everything is recorded as backward and the hay is damaged. Roots are not much damaged by fly however, and the most serious statement is that the prospects for fruit and cereals will be bad unless we get more sunshine. The report from Kent is even more satisfactory. Everything is recorded as backward but no serious damage is stated to have occurred. Many of the fruit crops are said to be good, and though insect pests are prevalent in places, hops are fairly free from mildew and insects. Damage by frosts is recorded. The news from Scotland is of a similar nature. Everything backward, but very little damage done as yet. The cry everywhere is for more warmth and sunshine. Fruit has been retarded by the cold and rain, and the green fly appears to thrive in the wet condition of things. It is noticeable that they suck the underside of the leaves during a continued rainfall. The Board would be glad to receive, during the month of July, any observations on the influence of the weather on the progress of the root crops and the turnip fly.

As is recorded elsewhere, the Board issued, in the last week in June, a notice to the effect that in view of the unseasonable weather the conservation of hay in the form of silage was worthy of consideration and a leaflet on the subject might be obtained on application. In response to this suggestion several hundred letters have been received from all parts of the Kingdom, many of which show that the question is, in the opinion of the writers, one of importance. Other letters received at the Board's Offices show that mildews are present in many places, and in more than one instance potatoes have been affected with disease (*Phytophthora infestans*). The Board would be glad to receive information on this subject during the coming months of July and August.

Notes on Crop Prospects Abroad.

Roumania.—A report issued by the Roumanian Ministry of Agriculture on June 5th, stated that the drought had seriously compromised a large number of sowings throughout the whole country. The autumn sowings, wheat, barley and rye, which were unsatisfactory at the end of the winter, made but little progress during May, and remained short and thin in the greater part of Wallachia. In many places the late sowings had dried up, and part had been turned into pasture, while part had, with difficulty, been ploughed up for other crops. Rye and barley are looking better than wheat, and it is believed that the recent rains may save that part of the crop which is in fairly good condition. The spring sowings were in a very unsatisfactory state.

Holland.—According to a report published by the Ministry of Agriculture on June 6th, the changeable weather in May has injured the prospects of the fruit crops. The excessive heat experienced at the beginning of the month followed by sharp frosts was mainly responsible for this; in some parts the fruit suffered severely through hail-storms, whilst insects have also caused damage in other parts. Notwithstanding these conditions fair crops are expected nearly everywhere.

In the case of apples, the prospects range from good to very good; pears, plums, gooseberries and currants are all good. Early potatoes have suffered somewhat from frost, but the prospects on the whole are fairly good.

A report issued by the Dutch Ministry of Agriculture on June 15th, states that, as in some districts numerous fields of winter wheat had been ploughed, more flax has been sown than was originally intended. In almost all flax-growing centres the "Brand ziekte" has caused more or less damage. The condition of flax on the heavy clay grounds in Groningen is only medium. In consequence of the drought after sowing time the crop on these grounds is thin and irregular. On the lighter grounds in that province the condition is good to very good. The condition is good in Friesland, North Holland, South Holland and Zeeland, and in western North Brabant it is fairly good.

Mr. Consul Churchill also forwards, through the Foreign Office, a translation of a report dated June 16th, 1907, issued by the Ministry of Agriculture on the bulb industry, which states, that on the whole the state of the crops is satisfactory. Owing to the cool weather the bulbs remained longer than usual under ground, thereby increasing their weight. Tulips are good in most districts, but in some, red tulips are not as fine as was expected. The same may be said of some varieties of double tulips. This is mainly attributed to the excessive heat at the beginning of May, and the frost during the latter part of that month. A great deal of damage from disease is reported to hyacinths and narcissi, but the conditions as regards hyacinths are on the whole very good. In South Holland the narcissi are universally good, and in North Holland they are also satisfactory, except in one or two districts where they are only fairly good.

Russia.—According to a report from Mr. Consul Medhurst, dated June 4th, the prospects for the new crops in the South-Eastern districts of Russia were much improved by the rains which fell during the latter part of May.

A later report from Sir A. Nicolson, dated June 21st, states that the general condition of the crops in European Russia was unsatisfactory at the end of May. Very hot and dry weather, accompanied by hot winds, had prevailed in the South and South-West and in the Caucasus, whilst in the rest of the country, with the exception of a part of the Central Black Earth district, growth was arrested by the unusually cold weather, snow having fallen as late as the beginning of June. In Little Russia, in the North-West and in the central agricultural district the crops suffered not only from cold but from want of rain. There have lately been heavy rains in the South, and there are prospects of a better harvest than seemed likely in the Spring. As regards winter corn in European Russia, about 34 per cent. of the crops are described as below the average; 19 per cent. are average, and 15 per cent. are bad and unsatisfactory. The worst districts in this respect are the Governments

of Pskoff, Kaluga, Moscow, Smolensk, Tver, Chernigoff, Vitebsk, Minsk, Mohileff Volhynia, Kieff, Podolia, Cherson and Bessarabia. The conditions were specially unfavourable in the two latter provinces, where extreme drought prevailed. Forty-three per cent. of the winter crops are reported to be satisfactory and 18 per cent. good.

Summer sowing was late this year and in many parts had scarcely begun at the end of May, so that the growth over about half of the area sown is as yet too slight to admit of prophecy, but the crop can scarcely be a heavy one. Of the remainder, 11 per cent. are reported to be good, 33 per cent. satisfactory, and 12 per cent. below the average.

Germany.—The official report on the crops in the middle of June shows an improved condition generally compared with the previous month. The numerical standard is as follows:—winter wheat, 2·9; spring wheat, 2·4; winter rye, 2·7; spring rye, barley and oats, 2·3; potatoes, 2·5 (1 = very good, 2 = good, 3 = average or medium, 4 small and 5 very small).

Hungary.—According to the report of the Hungarian Minister of Agriculture on the state of the crops in the middle of June, the production of wheat is estimated at about 62,500,000 cwts., as against 102,300,000 cwts. last year, the production of rye at 19,960,000 cwts., against 27,600,000 cwts., and of barley, 24,970,000 cwts., against 28,800,000 cwts. The condition of the maize plants, of potatoes, hops and sugar-beet is on the whole satisfactory.

United States.—The Crop Reporting Board of the Department of Agriculture states that preliminary returns of the acreage of spring wheat on June 1st indicate an area of about 16,464,000 acres, a decrease of 1,242,000 acres, or 7 per cent., as compared with the final estimate of the acreage sown last year. The average condition was 88·7, as compared with 93·4 on June 1st last year.

The average condition of winter wheat on June 1st was 77·4, as compared with 82·7 on the corresponding date last year, and with a ten-year average of 81·1. The total area reported under oats is about 31,491,000 acres, an increase of 532,000 acres, as compared with the final estimate of the area sown last year. The average condition was 81·6, against 85·9 in 1906. The acreage under barley is less than that finally estimated as sown last year by about 171,000 acres, the condition being 84·9, against 93·5 in 1906.

France.—According to the official report on the crops on May 15th (issued in the *Journal Officiel*, June 15th), the area sown is as follows. The figures for the same date in 1906 are given for comparison:—

——	1907.	1906.
	Acres.	Acres.
Winter wheat	15,684,534	15,539,155
Spring wheat	435,275	495,434
Rye	3,084,047	3,079,820
Oats	9,496,162	9,493,778
Barley	1,777,758	1,762,367

In the case of winter wheat the condition of the crops is stated to be good on an area of 9,092,000 acres, fairly good on 5,869,000 acres, and passable on 724,000 acres.

Miscellaneous Notes.

Degeneration of Potatoes.—A case of what is termed degeneration in potatoes has been reported from Warwickshire. The runners from the potato stems instead of bearing tubers were pointed, and after pushing their way through the top and sides of the ridges opened into leaf. Such cases have been recorded occasionally since the introduction of potato cultivation into Europe. The latest theory, supported by experiments, is that the suppression of tubers is due to the absence of a certain fungus which in the ordinary potato occurs in a state of symbiosis, and thereby causes the formation of tubers. The whole subject is one of great interest, and is at present the subject of study at Kew Gardens.

Leaflet as to Ensilage.—In view of the unsettled character of the weather and of the consequent difficulty in securing the hay crop, the Board of Agriculture and Fisheries issued a Press Notice at the end of June, drawing the attention of farmers and others to the system of ensilage as a means of conserving crops of grass and clover. Copies of Leaflet No. 9, which describes this process, may be obtained post free and free of charge upon application to the Secretary, Board of Agriculture, 4, Whitehall Place, London, S.W. Letters of application so addressed need not be stamped.

Chicago Cattle and Horse Show.—The Board are informed by the British Consul at Chicago that the Annual Cattle and Horse Show will be held at the Chicago stock yards in December next. Mr. Finn observes that at this show there have always been prize-winning specimens of British breeds of cattle and horses, but although some very good Shire and Hackney horses are brought in, the results are not favourable owing to few mares of these breeds being imported. It will therefore take several generations before either breed gets a real hold in America, unless some English breeder will risk sending some good mares to a Show, such as the Chicago one, and selling them by auction at its close. The United States breeder would then get some stock from which to breed and would be more inclined to purchase fresh blood in the future.

Demand for Grass Seed in Germany.—His Majesty's Consul at Dantzig in his Report to the Foreign Office (Annual Series, No. 3,819), observes that clover and grass seeds were scarce in Prussia in 1906, and British grass seeds were in good demand at high prices. There was also an increasing demand for agricultural machines.

Effect of Fresh Air on the Growth of Calves.—According to a note in the *Deutsche Land. Presse* (April 6th, 1907), an experiment was conducted in Curland to compare the growth of calves when confined in the cow-house, and when turned out in a yard during the day. Two similar lots, of eight and nine calves respectively, were thus treated for about five weeks, and it was found that those turned out in the open air made consistently better progress than those confined in the sheds. The average increase in the five weeks was 58 lb. in the former case compared with 39 lb. in the latter, the feeding being identical in each case.

Sorrel Dock or Sheep's Sorrel.—This weed, *Rumex acetosella* L., is sometimes exceedingly troublesome, and may even almost monopolize the ground whatever be sown. Where the weed is giving trouble lime should be applied at the rate of 30 cwts. per acre if the land is light, or up to 3 tons per acre if the soil is heavy and wet.

Reclamation of Mud Flats.—A useful grass for the protection of muddy foreshores is the *Spartina stricta*, which is found in places all along the south coast of England, and also up the east coast as far as Lincolnshire. Another variety, *Spartina alterniflora*, is restricted in this country to the Southampton district, where it has become very abundant. This species, which may possibly have been introduced from America, is of stronger and more rapid growth than the native *S. stricta.* This grass, it is believed, rarely seeds, but in any case it is confined to muddy foreshores, and is not likely to thrive in any adjacent agricultural land. If the shore to be protected is sandy and not muddy, good results cannot be expected from these grasses. Lord Montagu of Beaulieu in giving evidence before the Royal Commission on Coast Erosion referred to the useful qualities of these grasses in the reclamation of mud flats, and an article on the subject appeared in the *Kew Bulletin*, No. 5, 1907.

SELECTED CONTENTS OF CURRENT PERIODICALS.

Transactions of the Royal Scottish Arboricultural Society. Vol. xx., Part 2.

The Value of Waste Land for Afforestation Purposes, *A. C. Forbes;* A Century of Forestry—1806 to 1906—on the Estate of Learney, Aberdeenshire, *Francis N. Innes;* Soil: Its Origin and Nature, *Prof. James Geikie.*

Quarterly Journal of Forestry. July, 1907.

Mismanagement of Quick Fences in England, *E. R. Pratt;* Life-History of the Beech, *G. T. Boulger.*

Annales de l'Institut Nationale Agronomique. 2e Série. Vol. ii.

Recherches sur la Nitrification intensive et l'Établissement des Nitrières à hauts Rendements, *Müntz et Lainé;* Etude sur la Valeur de la Cyanamide de Calcium comme Engrais Azoté, *A. Müntz et P. Nottin;* L'Acariose des Avoines ou Maladie des Avoines vrillées, *Dr. Paul Marchal.*

Zeitschrift für Pflanzenkrankheiten, Band, xvii., Heft 2.

Untersuchungen über das Wesen und die Bekämpfung der Schwarzbeinigkeit der Kartoffeln, *Kleberger.*

Mitteilungen der Landw. Institute, Univ. Breslau, iv., Band, Heft 1, 2.

Zur Frage der Stickstoffbindung im Ackerboden, *Dr. F. Löhnis;* Die Bewegung des Ammoniakstickstoffs in der Natur, *Paul Ehrenberg-Breslau;* Beiträge zum Werte der heutigen Bodenanalyse, *C. Bloch und M. Hoffmann.*

Landwirtschaftlichen Versuchs-Stationen. Band lxvi. Heft iv. u. v.

Die Bestimmung der Zitronensäurelösichen Phosphorsäure in Thomasmehlen, *Paul Wagner, R. Kunze und W. Simmermacher;* Die Verwendbarkeit des Kalkstickstoffs zur Düngung der Kulturpflanzen, *Paul Wagner, R. Dorsch, Siegmund Hals und M. Popp.*

Heft vi. Beziehungen zwischen den Eigenschaften des Bodens und der Nahrstoffaufnahme durch die Pflanzen-Untersuchungen, in Gemeinschaft mit *Dr. E. Coppernrath und Dr. J. Hasenbäumer*, ausgeführt von *Dr. J. König;* Über die Verteilung von Nahrstoffen in den verschieden feinen Bestandteilen des Bodens, *Prof. Dr. Puchner-Weihenstephan.*

Naturwissenschaftliche Zeitschrift für Land-und Forstwirtschaft. 5 Jahrgang, Heft 5.

Altes und neues über den Schaden einiger Vogelarten, *Knotek;* Versuche über Forstdüngung im Grossbetriebe, *Schwappach;* Zur Kentniss der Morphologischen Veränderungen der Getreidekörner unter dem Einflusse klimatischer Verhältnisse, *Raum.*

Jahresbericht der Vereinigung für Angewandte Botanik. Vierter Jahrgang, 1906.

Bericht über die 4e Hauptversammlung der Vereinigung in Hamburg vom 11–16 September, 1906; Verhandlungen der I. Internationalem Konferenz für Samenprüfung zu Hamburg vom 10–14 September, 1906.

Landwirtschaftliches Jahrbuch der Schweiz. 20 Jahrgang.

Die Wiesendüngung, *A. Grete;* Kulturversuche mit Wicken, *Dr. F. G. Stebler* und *Dr. A. Volkart.*

Landwirtschaftliche Jahrbücher, Band, xxxvi., Heft 2.

Untersuchungen über den Einfluss der Ernährung auf die Milchsekretion des Rindes, *Dr. W. von Knierem* und *A. Buschmann;* Ein Beitrag zur Kenntnis der Korrelationen im pflanzlichen Stoffwechsel, *B. Hansteen;* Eine chemische Bodenanalyse für pflanzenphysiologische Forschungen, *E. A. Mitscherliche.*

Agricultural Gazette of New South Wales. Vol. xviii.

No. 3.—The Effects of some Fungicides recommended for the Prevention of "Stinking Smut" (Bunt) on the Germination of Wheat Seeds, *G. L. Sutton*, and *J. T. Pridham.*

No. 4.—Milling Characteristics of Australasian Wheats, *F. B. Guthrie* and *G. W. Norris.*

Agricultural Journal of the Cape of Good Hope. Vol. xxx., No. 4.

Wheat in Cape Colony. A Report on Recent Experiments, *Dr. E. A. Nobbs.*

ADDITIONS TO THE LIBRARY.

Africa—

Transvaal—Department of Agriculture, Report, 1905–6. (322 pp.) Pretoria: Government Printing Office, 1907.

Austria-Hungary—

Bericht über die Verbreitung der Reblaus in Österreich, 1904–6. (332 pp.) Vienna: K. K. Ackerbauministerium, 1907.

France—

Silvestre C.—Annuaire de l'Agriculture et des Associations Agricoles, 1907. (3007 pp.) Paris: Ch. Amat.

Germany—

Möbius, Dr. M.—Botanisch-mikroskopisches Praktikum für Anfänger. (121 pp.) Berlin: Borntraeger, 1903. 2 m. 80.

Böhme, Dr. G.—Landwirtschaftliche Sünden. (6^e. Auflage). (253 pp.) Berlin: Paul Parey, 1906.

Jahresbericht der Vereinigung für angewandte Botanik, 1906. (347 pp. + 8 plates.) Berlin: Borntraeger, 1907.

Fruwirth, C.—Die Züchtung der Landwirtschaftlichen Kulturpflanzen. Band IV. (380 pp.) Berlin: Paul Parey, 1907.

Great Britain—

Jebb, Miss L.—The Small Holdings of England. (445 pp.) London: John Murray, 1907. 10s. 6d. net.

Björling, P. R., & Gissing, F. T.—Peat: Its Use and Manufacture. (173 pp.) London: Chas. Griffin & Co., Ltd., 1907. 6s. net.

Woodruffe-Peacock, Rev. E. A.—Grouse Disease. (111 pp.) Louth: Goulding, 1907. 5s.

Royal Botanic Gardens, Kew.—Official Guide to the Museums of Economic Botany. No. 1. Dicotyledons. 3rd Edition. (236 pp.). London, 1907. 10d.

Massee, George.—A Text Book of Plant Diseases. 3rd Edition. (472 pp.) London: Duckworth, 1907. 6s. net.

Park, Edith E.—Farming for Ladies. (27 pp.) London: Vinton & Co., 1907. 1s. net.

British Museum (Natural History).—Illustrations of British Blood-sucking Flies, with Notes by E. E. Austen. (74 pp. + 34 plates.) London: Longmans & Co.

M'Clellan, F. C.—Students' Guide to the Forest Garden, Oakley Park Woods, &c. (44 pp.) Royal Agricultural College, Cirencester, 1907.

Suffolk Sheep Society.—The Flock Book of Suffolk Sheep. Vol. XXI. Rams. Nos. 9320–9780. (252 pp.) Bury St. Edmunds, 1907.

Gaut, Alfred.—Seaside Planting of Trees and Shrubs. (101 pp.) London: "Country Life" Offices, 1907.

Royal Scottish Aboricultural Society.—Transactions. Vol. XX, Part II. (28 pp.) Edinburgh: Douglas & Foulis, 1907. Price to Non-Members, 3s.

University of Leeds:—

Bull. 65.—Amount of Fat and other Solids in New Milk. (2 pp.)

Bull. 66. Variation in the Chemical Composition of Butter. (23 pp.) Leeds, 1907.

South Eastern Agricultural College, Wye.—Report from the Analytical Laboratory. (61 pp.).

India—

Board of Scientific Advice for India.—Report, 1905–6. (171 pp.) Calcutta: Government Central Press, 1907. 1s. 9d.

Sweden—

Kungl. Landtbruksstyrelsens underdåniga berättelse, 1905. (452 pp.) Stockholm: Aftonbladets Tryckeri, 1907.

United States—

Bailey, L. H.—The Outlook to Nature. (296 pp.) 1905. 5s. net. Principles of Agriculture. (300 pp.) 1906. 4s. 6d. net. Plant Breeding. (483 pp.) 1906. 5s. net. London: Macmillan.

Herrick, R. F.—Denatured or Industrial Alcohol. (516 pp.) London: Chapman & Hall, 1907.

Department of Agriculture, Bureau of Animal Industry:—Report for 1905. (364 pp.) 1907.

Circ. 104. Welsh Black Cattle. (20 pp. + 5 plates). Circ. 105. Baby Beef. (34 pp.) Circ. 108. Trichinosis: A Danger in the Use of Raw Pork for Food. (6 pp.)

Bull. 93. The Relation of Tuberculous Lesions to the Mode of Infection. (19 pp.) 1906.

Bull. 95. The Bacteriolytic Power of the Blood Serum of Hogs. (62 pp.)

Bureau of Biological Survey:—

Circ. 55. Directions for the Destruction of Wolves and Coyotes. (6 pp.)

Circ. 56. Value of Swallows as Insect Destroyers. (4 pp.)

Circ. 57. Birds Useful in the War against the Cotton Boll-Weevil. (4 pp.)

Circ. 58. Destruction of Deer by the Northern Timber Wolf. (2 pp.)

Bureau of Entomology:—

Circ. 85. The Spring Grain-Aphis. (7 pp.) Circ. 86. The Corn Leaf-Aphis and Corn Root-Aphis. (13 pp.)

Bull. 64.—Part I. The Mexican Conchuela in Western Texas in 1905; Part II. Notes on the Economic Importance of Sowbugs: Part III. Notes on "Punkies." (28 pp.)

Bull. 65. The Tobacco Thrips. (22 pp.)

Bull. 66.—Part II. The Water-Cress Sowbug and Leaf-Beetle. (20 pp.)

Technical Series, No. 12, Part III. A Contribution to our Knowledge of the Thysanoptera of California. (68 pp.) Washington, 1907.

Office of Experiment Stations:—

Bull. 173. Corn-Harvesting Machinery. (48 pp.)

Bull. 178. Course in Fruit Growing for movable Schools of Agriculture. (100 pp.)

Farmers' Bulletin.

No. 280. A profitable tenant Dairy Farm. (16 pp.)

No. 282. Celery. (36 pp.)

No. 284. Insect and fungous Enemies of the Grape, East of the Rocky Mountains. (48 pp.)

No. 285. Advantage of Planting heavy Cotton Seed. (16 pp.)

No. 286. Comparative Value of whole Cotton Seed and Cotton-Seed Meal in Fertilizing Cotton. (14 pp.)

No. 288. Non-saccharine Sorghums. (28 pp.)

No. 289. Beans. (28 pp.)

No. 290. The Cotton Boll-Worm. (32 pp.)

Forest Service:—

Circ. 52. The Lumber Cut of the United States in 1905. (23 pp.) Circ. 76. Silver Maple. (3 pp.) Circ. 81. Forest Planting in Illinois. (32 pp.) Circ. 82. Hardy Catalpa. (8 pp.) Circ. 83. Russian Mulberry. (3 pp.) Circ. 84. White Ash. (4 pp.) Circ. 85. Slippery Elm. (4 pp.) Circ. 86. Box Elder. (3 pp.) Circ. 87. White Willow. (4 pp.) Circ. 88. Black Walnut. (5 pp.) Circ. 89. Tamarack. (4 pp.) Circ. 90. Osage Orange. (3 pp.) Circ. 91. Coffeetree. (4 pp.) Circ. 92. Green Ash. (4 pp.) Circ. 93. Yellow Poplar. (4 pp.) Circ. 94. Black Cherry. (3 pp.) Circ. 95. Sugar Maple. (4 pp.) Circ. 98. Quantity and Character of Creosote in well preserved Timber. (16 pp.)

[Books may be borrowed from the Board's Library on certain conditions, which may be ascertained on application.]

PRICES OF AGRICULTURAL PRODUCE.

AVERAGE PRICES of LIVE STOCK in ENGLAND and SCOTLAND in the Month of June, 1907.

(*Compiled from Reports received from the Board's Market Reporters.*)

Description.	England. First Quality.	England. Second Quality.	Scotland. First Quality.	Scotland. Second Quality.
FAT STOCK :—	per stone.*	per stone.*	per cwt.†	per cwt.†
Cattle :—	s. d.	s. d.	s. d.	s. d.
Polled Scots	8 4	8 2	39 11	36 8
Herefords	8 5	7 11	—	—
Shorthorns	8 2	7 7	38 11	36 0
Devons	8 5	7 8	—	—
	per lb.* d.	per lb.* d.	per lb.* d.	per lb.* d.
Veal Calves	8¼	7½	8½	7
Sheep :—				
Downs	9	8¼	—	—
Longwools	8½	8	—	—
Cheviots	9¾	9	9¾	8¾
Blackfaced	9	8¾	9¾	8½
Cross-breds	9	8¼	10	9
	per stone.*	per stone.*	per stone.*	per stone.*
Pigs :—	s. d.	s. d.	s. d.	s. d.
Bacon Pigs	6 8	6 4	6 4	5 6
Porkers	7 0	6 7	6 9	6 0
LEAN STOCK :—	per head.	per head.	per head.	per head.
Milking Cows :—	£ s.	£ s.	£ s.	£ s.
Shorthorns—In Milk	20 13	17 12	22 10	17 19
,, —Calvers	19 12	16 19	19 17	17 4
Other Breeds—In Milk ..	20 12	16 7	18 16	15 9
,, —Calvers ...	—	—	18 15	15 7
Calves for Rearing	2 3	1 15	2 9	1 14
Store Cattle :—				
Shorthorns—Yearlings ...	9 15	8 9	9 16	8 2
,, —Two-year-olds ...	14 8	12 6	14 8	12 7
,, —Three-year-olds	17 14	15 1	16 1	13 19
Polled Scots—Two-year-olds	—	—	15 15	13 16
Herefords— ,,	14 10	13 8	—	—
Devons— ,,	14 7	13 14	—	—
Store Sheep :—	s. d.	s. d.	s. d.	s. d.
Hoggs, Hoggets, Tegs, and Lambs—				
Downs or Longwools ...	44 6	37 4	—	—
Scotch Cross-breds	—	—	44 3	37 5
Store Pigs ;—				
Under 4 months	30 0	22 3	23 6	19 7

* Estimated carcase weight.

† Live weight.

AVERAGE PRICES of DEAD MEAT at certain MARKETS in ENGLAND and SCOTLAND in the Month of June, 1907.

(*Compiled from Reports received from the Board's Market Reporters.*)

Description.	Quality.	London.		Birmingham.		Manchester.		Liverpool.		Glasgow.		Edinburgh.	
		per cwt.		per cwt.		per cwt.		per cwt.		per cwt.		per cwt.	
BEEF :—		*s.*	*d.*	*s.*	*d.*	*s.*	*d.*	*s.*	*d.*	*s.*	*d.*	*s.*	*d.*
English	1st	55	6	55	0	56	6	—		60	6*	59	6*
	2nd	53	6	50	6	53	0	—		57	0*	54	0*
Cow and Bull ...	1st	—		48	0	48	0	43	6	49	0	48	0
	2nd	—		41	6	41	6	39	0	42	6	41	6
U.S.A. and Canadian :—													
Port Killed ...	1st	55	0	53	6	55	0	53	6	56	0	51	6
	2nd	50	0	49	0	51	6	49	0	54	6	—	
Argentine Frozen—													
Hind Quarters ...	1st	36	6	37	6	36	6	36	6	38	6	38	0
Fore ,, ...	1st	30	0	32	0	31	6	30	6	32	6	32	6
Argentine Chilled—													
Hind Quarters ...	1st	46	0	47	0	44	6	44	6	—		51	6
Fore ,, ...	1st	31	0	33	0	31	6	32	6	—		35	0
American Chilled—													
Hind Quarters ...	1st	57	0	55	6	55	0	55	0	57	0	56	6
Fore ,, ...	1st	36	0	36	6	35	0	35	0	37	6	37	6
VEAL :—													
British	1st	67	0	64	6	69	6	76	6	—		—	
	2nd	63	0	52	6	63	0	70	0	—		—	
Foreign	1st	67	6	—		—		—		—		58	6
MUTTON :—													
Scotch	1st	84	0	—		83	0	84	0	84	6	78	0
	2nd	79	6	—		78	0	79	6	73	6	63	0
English	1st	79	6	73	0	78	0	79	6	—		—	
	2nd	69	6	60	0	70	6	73	0	—		—	
U.S.A. and Canadian—													
Port killed ...	1st	—		65	6	—		70	0	74	6	—	
Argentine Frozen ...	1st	32	0	34	0	35	0	35	0	34	0	33	0
Australian ,, ...	1st	32	0	32	6	32	6	32	6	34	0	31	6
New Zealand ,, ...	1st	42	0	37	6	42	0	42	6	34	0	—	
LAMB :—													
British	1st	91	0	84	6	85	6	85	6	97	6	86	6
	2nd	78	0	76	6	79	6	81	6	88	6	78	0
New Zealand ..	1st	52	6	54	6	51	6	51	6	54	0	55	0
Australian	1st	46	0	47	6	46	0	46	0	46	6	—	
Argentine	1st	—		47	0	45	6	45	0	46	0	—	
Pork :—													
British	1st	56	0	62	6	59	6	58	6	56	0	52	0
	2nd	49	6	52	0	56	0	55	0	53	6	46	0
Foreign	1st	53	6	59	6	60	0	60	0	—		—	

* Scotch.

AVERAGE PRICES of **British Corn** per Quarter of 8 Imperial Bushels, computed from the Returns received under the Corn Returns Act, 1882, in each Week in 1905, 1906 and 1907.

Weeks ended (*in* 1907).	Wheat.			Barley.			Oats.		
	1905.	1906.	1907.	1905.	1906.	1907.	1905.	1906.	1907.
	s. d.	*s. d.*	*s. d.*	*s. d.*	*s. d.*	*s. d.*	*s. d.*	*s. d.*	*s. d.*
Jan. 5 ...	30 4	28 4	26 0	24 4	24 6	23 11	16 3	18 2	17 3
,, 12 ...	30 4	28 6	26 1	24 6	24 8	24 2	16 3	18 4	17 4
,, 19 ...	30 5	28 5	26 1	25 0	24 11	24 1	16 5	18 4	17 5
,, 26 ...	30 6	28 7	26 2	25 1	25 1	24 5	16 7	18 7	17 5
Feb. 2 ...	30 6	28 10	26 3	25 0	25 1	24 4	16 7	18 10	17 5
,, 9 ...	30 7	28 10	26 6	25 2	25 3	24 5	16 8	18 10	17 7
,, 16 ...	30 5	28 11	26 7	25 2	25 6	24 1	16 9	19 0	17 7
,, 23 ...	30 10	28 10	26 10	25 0	25 4	24 2	16 10	19 0	17 9
Mar. 2 ...	30 8	28 8	26 9	25 2	25 0	24 2	16 10	19 0	17 9
,, 9 ...	30 9	28 5	26 8	25 2	25 1	23 11	16 10	18 8	17 11
,, 16 ...	30 10	28 5	26 10	24 11	24 8	24 2	16 10	18 10	18 0
,, 23 ...	30 9	28 4	26 10	25 2	24 4	24 0	17 0	18 8	18 1
,, 30 ...	30 9	28 3	26 8	25 1	24 5	23 9	16 11	18 11	18 2
Apl. 6 ...	30 9	28 7	26 9	25 6	24 2	24 3	17 0	18 11	18 3
,, 13 ...	30 8	28 11	26 8	24 3	24 4	23 9	17 6	19 4	18 6
,, 20 ...	30 8	29 4	26 8	24 4	24 0	23 3	17 5	19 1	18 7
,, 27 ...	30 9	29 6	26 10	24 4	24 0	23 3	17 9	19 6	18 9
May 4 ...	30 8	29 10	27 0	25 3	23 10	23 6	18 0	19 9	19 3
,, 11 ...	30 8	30 1	27 6	24 10	24 1	24 0	18 3	20 0	19 7
,, 18 ...	30 10	30 3	28 4	24 8	23 10	23 10	18 5	20 1	20 1
,, 25 ...	30 11	30 4	29 7	24 4	24 2	24 3	18 8	20 2	20 5
June 1 ...	31 3	30 4	31 4	23 6	22 10	24 0	19 1	20 5	20 8
,, 8 ...	31 4	30 3	32 0	24 0	23 4	24 7	18 11	19 11	20 7
,, 15 ...	31 7	30 4	31 10	26 0	23 6	24 7	19 1	20 2	20 11
,, 22 ...	31 7	30 5	31 4	23 9	22 10	24 11	18 10	20 2	20 9
,, 29 ...	31 8	30 3	31 2	23 2	24 3	24 6	19 7	20 1	20 8
July 6 ...	32 1	30 2	31 3	22 11	23 0	24 8	19 6	20 2	20 11
,, 13 ...	32 3	30 5		23 10	23 8		19 7	20 4	
,, 20 ...	32 2	30 3		23 7	23 2		18 11	20 5	
,, 27 ...	32 3	30 5		23 11	22 4		19 3	20 2	
Aug. 3 ...	31 11	30 9		22 0	22 1		18 4	19 3	
,, 10 ...	30 5	30 5		22 5	23 0		16 11	17 11	
,, 17 ...	28 5	29 0		23 4	24 2		16 4	17 0	
,, 24 ...	27 1	27 9		23 6	25 0		15 9	16 10	
,, 31 ...	26 11	26 9		23 5	24 3		15 9	16 6	
Sept. 7 ...	27 1	26 4		23 4	24 9		15 11	16 3	
,, 14 ...	26 11	25 11		23 7	24 3		16 0	16 1	
,, 21 ...	26 8	25 9		23 10	24 3		15 11	16 0	
,, 28 ...	26 9	25 9		24 3	24 8		16 1	16 2	
Oct. 5 ...	26 9	26 1		24 9	25 0		16 3	16 3	
,, 12 ...	26 11	26 3		24 10	25 3		16 6	16 7	
,, 19 ...	27 1	26 6		25 0	24 10		16 7	16 8	
,, 26 ...	27 4	26 7		24 11	24 10		16 8	16 10	
Nov. 2 ...	27 10	26 7		24 9	24 8		17 1	16 11	
,, 9 ...	28 3	26 6		24 10	24 8		17 4	17 1	
,, 16 ...	28 7	26 4		24 6	24 4		17 8	17 2	
,, 23 ...	28 5	26 3		24 6	24 1		17 9	17 3	
,, 30 ...	28 8	26 1		24 6	24 1		17 11	17 2	
Dec. 7 ...	28 6	26 1		24 7	24 1		17 11	17 4	
,, 14 ...	28 5	26 1		24 5	23 11		17 11	17 3	
,, 21 ...	28 4	26 3		24 6	24 3		17 11	17 3	
,, 28 ...	28 3	26 0		24 7	24 1		18 1	17 3	

AVERAGE PRICES of **Wheat, Barley,** and **Oats** per Imperial Quarter in FRANCE, BELGIUM, and GERMANY, and at PARIS, BERLIN, and BRESLAU.

—		Wheat. 1906.	Wheat. 1907.	Barley. 1906.	Barley. 1907.	Oats. 1906.	Oats. 1907.
		s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
France:	May ...	39 10	40 3	25 6	26 6	22 9	22 9
	June ...	38 11	42 6	25 5	26 7	23 0	23 0
Paris:	May ...	39 5	41 9	25 10	26 2	23 0	22 11
	June ...	39 3	44 5	26 5	27 8	23 8	23 3
Belgium:	April ...	30 6	29 4	24 7	25 6	21 7	21 7
	May ...	30 8	31 6	24 5	26 9	22 5	22 2
Germany:	May ...	39 4	44 3	26 7	31 6	23 11	26 9
	June ...	39 2	45 6	25 11	31 10	24 5	27 6
Berlin:	April ...	39 9	42 4	—	—	23 4	25 11
	May ...	40 4	44 6	—	—	23 4	27 7
Breslau:	April ...	35 8	38 6	27 9 (brewing) 25 1 (other)	29 7 (brewing) 25 2 (other)	21 9	23 9
	May ...	35 8	42 4	27 9 (brewing) 25 1 (other)	29 7 (brewing) 26 9 (other)	21 3	25 7

NOTE.—The prices of grain in France have been compiled from the official weekly averages published in the *Journal d'Agriculture Pratique*; the Belgian quotations are the official monthly averages published in the *Moniteur Belge*; the German quotations are taken from the *Deutscher Reichsanzeiger*, the prices for the German Empire representing the average of the prices at a number of markets.

AVERAGE PRICES of **British Wheat, Barley,** and **Oats** at certain Markets during the Month of June, 1906 and 1907.

—	Wheat. 1906.	Wheat. 1907.	Barley. 1906.	Barley. 1907.	Oats. 1906.	Oats. 1907.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
London...	31 2	32 1	23 6	25 5	20 10	21 4
Norwich	30 3	31 6	19 6	24 0	19 4	20 5
Peterborough	30 1	31 4	23 5	24 4	19 9	20 6
Lincoln...	29 6	31 6	22 8	24 3	19 6	20 7
Doncaster	28 10	31 2	—	—	20 3	21 6
Salisbury	30 5	31 6	22 6	26 0	20 1	20 4

AVERAGE PRICES of PROVISIONS, POTATOES, and HAY at certain MARKETS in ENGLAND and SCOTLAND in the Month of June, 1907.

(Compiled from Reports received from the Board's Market Reporters.)

Description.	London.		Bristol.		Liverpool.		Glasgow.	
	First Quality.	Second Quality.	First Quality.	Second Quality.	First Quality.	Second Quality.	First Quality.	Second Quality.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
BUTTER :—	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.
British ...	12 6	10 9	12 0	11 0	—	—	13 3	—
	per cwt.	per cwt.	per cwt.	per cwt.	per cwt.	per cwt.	per cwt.	per cwt.
Irish Creamery	102 0	99 6	102 0	100 0	98 0	95 6	99 6	98 0
,, Factory	94 0	88 0	92 0	86 0	90 0	84 0	—	—
Danish ...	107 6	105 6	—	—	107 6	103 6	108 0	—
Russian ...	92 6	90 6	92 0	88 0	90 6	82 0	94 6	86 6
Australian ...	96 0	94 0	94 6	88 0	91 0	86 0	98 0	—
New Zealand	100 0	98 0	100 6	98 0	100 0	96 0	—	—
CHEESE :—								
British—								
Cheddar ...	84 0	80 0	84 0	72 0	82 0	78 0	60 6	57 6
					120 lb.	120 lb.		
Cheshire ...	—	—	—	—	64 6	61 0	—	—
					per cwt.	per cwt.		
Canadian ...	67 0	65 6	68 6	66 6	61 0	60 0	62 0	—
BACON :—								
Irish	64 6	64 0	—	—	67 6	65 6	66 6	64 6
Canadian ...	60 0	—	63 6	60 0	61 6	57 6	62 0	59 6
HAMS :—								
Cumberland ...	104 0	96 0	—	—	—	—	—	—
Irish	102 0	96 0	—	—	—	—	89 0	83 0
American (long cut) ...	66 0	63 0	64 0	61 6	64 0	61 6	63 0	61 0
EGGS :—	per 120.	per 120.	per 120.	per 120.	per 120.	per 120.	per 120.	per 120.
British ...	10 0	8 4	8 9	—	—	—	—	—
Irish	8 10	7 10	7 9	7 3	7 7	7 1	7 10	6 11
Danish ...	9 1	7 10	—	—	8 6	7 6	8 4	7 5
POTATOES :—	per ton.	per ton.	per ton.	per ton.	per ton.	per ton.	per ton.	per ton.
Main crop ...	108 6	98 6	95 0	90 0	126 6	115 0	85 0	80 0
Scottish Triumph ...	98 6	90 0	90 0	80 0	110 0	100 0	—	—
Up-to-Date ...	101 0	92 6	86 0	76 0	110 0	100 0	85 0	80 0
HAY :—								
Clover ...	96 0	85 6	90 0	82 6	98 0	77 0	86 0	80 0
Meadow ...	88 0	78 0	85 0	75 0	—	—	83 6	78 6

DISEASES OF ANIMALS ACTS, 1894 to 1903.

NUMBER of OUTBREAKS, and of ANIMALS Attacked or Slaughtered.

GREAT BRITAIN.

(From the Returns of the Board of Agriculture and Fisheries.)

DISEASE.	JUNE.		6 MONTHS ENDED JUNE.	
	1907.	1906.	1907.	1906.
Swine-Fever :—				
Outbreaks	390	129	1,343	634
Swine Slaughtered as diseased or exposed to infection ...	1,488	859	6,245	3,440
Anthrax :—				
Outbreaks	108	93	609	519
Animals attacked	128	118	814	770
Glanders (including Farcy) :—				
Outbreaks	79	117	464	569
Animals attacked	230	197	1,140	1,053
Sheep-Scab :—				
Outbreaks	11	9	400	286

IRELAND.

(From the Returns of the Department of Agriculture and Technical Instruction for Ireland.)

DISEASE.	JUNE.		6 MONTHS ENDED JUNE.	
	1907.	1906.	1907.	1906.
Swine-Fever :—				
Outbreaks	7	20	63	49
Swine Slaughtered as diseased or exposed to infection ...	183	157	1,156	594
Anthrax :—				
Outbreaks	—	1	1	3
Animals attacked	—	5	3	7
Glanders (including Farcy) :—				
Outbreaks	1	—	1	3
Animals attacked	1	—	1	10
Sheep-Scab :—				
Outbreaks	20	5	178	145

(Wt. 1348 4,000 7 | 07—H & S 1824)

THE JOURNAL

OF THE

BOARD OF AGRICULTURE.

Vol. XIV. No. 5.

AUGUST, 1907.

THE MILLING PROPERTIES OF OATS.

R. B. GREIG AND W. M. FINDLAY.

It has always apparently been assumed by farmers that the proportion of oatmeal obtained from a given weight of oats (*a*) will depend on the weight per bushel; (*b*) will differ according to variety; (*c*) will vary with the same variety on different classes of soils and in different climates.

Speaking generally, it is understood that oats of heavy weight per bushel, with thin husks, and grown on a strong soil at a moderate elevation, will produce most meal per quarter. The farmer has arrived at this understanding indirectly, through the discrimination exercised by millers in offering for samples. Few attempts have been made to discover by actual experiment the agricultural factors which condition the milling properties of oats.

Past indifference to these matters is in part excusable, for the conditions are only partly within the control of the grower; moreover, the few experiments, the results of which have been published in agricultural journals, show the general superiority as milling oats of such popular and widely grown strains as Potato and Sandy, and the inferiority of other varieties is doubtless counterbalanced, in general opinion, by their greater productive power on the soils to which they are suited. In *Morton's Cyclopædia of Agriculture* experiments are quoted which establish the position of Sandy, Scotch Birlie and Potato as good milling oats. Until about 1890 nearly all varieties of oats grown in Scotland were of the same character in respect of milling, *i.e.*, they differed very little in size of grain and proportion of husk; and although it is stated

(*Stephen's Book of the Farm*) that "the finer class of oats give nearly 9 stones, and some as much as 12 stones per boll (of 16 stones)," such differences never appear in the tables of comparative experiments which have been examined by the writers.

The introduction of "cross-bred" oats by Messrs. Garton, of Warrington, and others, and more recently the advent of imported strains from Canada and the United States brought the milling properties of oats into greater prominence. Many of the new kinds are larger and much thicker in the husk than the old varieties, and, for a time at all events, were regarded with suspicion by the miller. The difficulty of obtaining the usual price for such varieties as Abundance and Banner when they were first introduced occasioned a number of milling tests to be made.

A great many estimates of milling power were also made by weighing the husk of the grain apart from the kernel, and expressing the result as a percentage; the assumption being that an oat with a large proportion of husk would be a poor miller. However satisfactory such laboratory examinations may be theoretically, they are not accepted as proof by the farmer and miller, and the purpose of this article is to supply some evidence obtained from the meal mill, as well as from the laboratory.

Varieties.—Allowing that percentage of husk indicates the mealing property of the variety, there is as yet little to show that the older strains are superior; and there is nothing to show that they have invariably a smaller proportion of husk. McAlpine and Tudhope (Report of Glasgow and West of Scotland Agricultural College, 1900) found that Potato and Banner oats from eight farms gave the same average proportion of husk, viz., 25·9 per cent. They also found that on thirteen farms the percentage of meal, and the calculated meal per acre, were as follows from four varieties :—

	Percentage of Meal.	Yield of Meal per Acre.
		Lb.
Waverley	64·5 ...	1,453
Newmarket	65·4 ...	1,446
Potato	65·4 ...	1,361
Tartar King	60·2 ...	1,354

In Cheshire (Report of Cheshire Agricultural College, 1902), the examination of, among others, five well-known varieties gave the following results, from which it appears that Waverley and Newmarket have less husk than Potato, and give more meal (by calculation) per acre. Storm King, with 7 per cent. more husk than Potato, also gives more meal per acre.

	Percentage of Husk.	Yield of Meal per Acre.
		Lb.
Waverley	24·64	1,669
Newmarket	23·43	1,548
Potato	25·39	1,423
Tartar King	30·65	1,442
Storm King	32·51	1,612

At the Garforth Experimental Farm at Leeds, a test covering four years shows a similar state of affairs as regards the husk; and in 1901–02 Wilson and Findlay (Trans. H. and Agric. Society), and in 1903 Hendrick (Bulletin 2, North of Scotland Agricultural College) found average results in Aberdeenshire confirming them. In 1904, however, for the first time in such tests, Potato showed less husk than any of the eight other varieties tried. If the proportion of kernel to husk is a criterion of the milling property of a variety, the numerous laboratory tests made by independent observers in different parts of the country with oats grown under varying conditions plainly show that Newmarket and Waverley are better millers than Potato, Tartar King and Storm King. That the first two and last two will, as a rule, produce more meal per acre no one will deny.

Actual Milling Tests.—Several comparisons of meal-producing power have recently been made by actually milling the grain of different varieties. The Irish Department of Agriculture tested nine varieties, using 1 ton of each. Details are given in the Journal of the Department, Vol. II, No. 3, and although, unfortunately, all the grain was not grown on one farm, most of it came from one district; and apart from this drawback the comparison is an excellent one.

In this test we find Waverley and Abundance, which closely resembles Newmarket, at the top of the list, as in the laboratory tests, and better than Potato. Waverley also produced the greatest quantity of grain per acre.

The percentages of meal were as shown below :—

	Percentage of Meal Obtained.
Waverley	64·00
Abundance	62·72
Birlie	61·60
Sandy	61·16
Potato	60·48
Goldfinder	60·26
Blantyre...	60·00
Pioneer	60·00
Tartar King	56·85

In the Sixth Annual Report of the Cumberland and Westmorland Farm School, a milling test of four varieties of oats is described. The weight of corn ground was in each case 26 stones.

	Percentage of Meal.	Yield of Meal per Acre.
		Lb.
Potato (Hamilton variety)	63·43	1,354
Waverley...	57·96	1,363
Goldfinder	53·84	1,321
Tartar King	53·84	1,419

In this test the difference between the productive power of the Hamilton Potato and Tartar King is enormous ; but, in spite of it, the greater crop of Tartar King gives more meal per acre.

The importance of the oat crop in the North of Scotland, and the reputation of the North Country oats for milling purposes, have made it desirable to test the milling properties of some of the new varieties ; and so, during the last four years, upwards of eighty milling tests have been made with some dozen varieties by the Aberdeen and North of Scotland College of Agriculture.

To describe all the experiments is unnecessary, but it may be explained that the quantity of oats milled varied from 4 bushels to 4 or 5 qrs. In one set of experiments 168 lb. of each variety were tested at five mills. In all cases the varieties compared in any mill were grown side by side in the same field in the neighbourhood of the mill. The results at any one mill are complete in themselves, but in regard to varieties they are comparable, for that year, with the results at any other mill, as the grain, no matter where grown and milled, was

the produce of the same original sample of seed. In the largest and most important variety test the grain was not only grown on the same field, and milled in the same mill, but, in order to eliminate the effect of the soil and climate, the seed was obtained from varieties grown side by side in the previous year. The most important tests were supervised by one of us, who is a practical miller.

In considering the results, it will be convenient to deal with the following questions :—(1) Are the new cross-bred and foreign oats as good millers as the old strains? (2) Do the laboratory estimates agree with the milling tests? (3) Do the heaviest oats give the largest quantity of meal? (4) What is the effect of soil on milling property?

Old versus New Strains as Millers.—The Potato oat is the most widely grown in Scotland and the North of England, and may be regarded as the standard for comparison. In 1903, milling tests were made by the College in Ross and Cromarty and in Morayshire. From the following table it will be seen that the old strains were superior in the former and inferior in the latter county, but the differences are slight :—

	Ross and Cromarty (average of four tests). Per cent. of Meal.	Morayshire (one test). Per cent. of Meal.
Old strains—		
Sandy	58·1	57·0
Potato	55·4	59·4
Hamilton...	53·4	—
Average	55·6	58·2
Cross breds—		
Newmarket	56·8	60·8
Goldfinder	53·1	61·1
Waverley	53·5	58·8
Storm King	53·8	61·7
Average	54·3	60·6
Importations—		
Banner	54·7	59·9
Siberian	—	60·1
Average	—	60·0

In Aberdeenshire, in 1904, forty comparative trials were made at five country meal mills. The quantity of grain tested was only 4 bushels, but the individual figures coincide fairly well with the average results; in fact, Potato and Scotch

Birlie were the only varieties that showed much inconsistency as between one mill and another, and it will be noticed that Potato is the worst miller.

	Percentage of Meal (average of five tests).
Old strains—	
Scotch Birlie	60·0
Potato	59·6
Average	59·8
Cross breds—	
Waverley	60·2
Newmarket	59·8
Average	60·0
Importations—	
Siberian	60·7
Thousand Dollar	60·3
Wide Awake	60·0
Banner	59·7
Average	60·1

The differences are very small, but they do not justify the reputation of the standard oats as superior millers.

In 1906 a more complete test, under the most careful supervision, did nothing to enhance the reputation of Potato. Seed of Thousand Dollar, Potato and Banner was obtained from one farm in Inverness-shire, and sown at Berrymoss, in Aberdeenshire, and Cowfords, in Morayshire. Four quarters of dressed grain of each variety were ground at Berrymoss and 5 qrs. at Cowfords.

Variety.	Percentage of Water.	Percentage of Husk in		Percentage of Dust in		Percentage of Meal Seeds in		Percentage of Oatmeal in	
		Raw Grain.	Dried Grain.	Raw Grain.	Dried Grain.	Raw Grain.	Dried Grain.	Raw Grain.	Dried Grain.
Berrymoss—									
Thousand Dollar ...	18·82	13·61	16·68	4·98	6·05	3·05	3·76	59·52	73·33
Potato	19·50	14·06	17·47	5·57	6·93	2·82	3·51	58·03	72·09
Banner	18·53	14·80	17·99	5·73	7·03	3·27	4·02	57·81	70·96
Cowfords—									
Thousand Dollar ...	10·71	13·69	15·33	4·17	4·66	2·95	3·33	68·51	76·66
Potato	11·90	12·79	14·53	3·87	4·39	3·27	3·71	68·21	77·36
Banner	13·69	13·69	15·80	4·76	5·53	4·17	4·83	63·69	73·79

Judging from these trials, the assumption that Potato and Sandy are considerably and invariably better millers than the newer varieties is seen to be erroneous. The weight of evidence

goes to show that the milling properties of the Potato are exaggerated in popular estimation, and that several cross-bred and foreign oats are quite equal, if not superior, to the common strains. When the total quantity of meal produced per acre is considered, the comparison is entirely favourable to the newer varieties.

Do the Laboratory Estimates Agree with the Milling Tests?—Apparently the estimates of milling power made by weighing husk and kernel are very wide of the mark. When the variety has a remarkably large proportion of husk—perhaps 7 to 10 per cent. more than the normal—the milling property is affected; but variations of 2 to 3 per cent, are no guide whatever. To determine this point, samples of grain to be afterwards milled were examined by Mr. Hendrick, as described in Bulletin 2 of the Aberdeen and North of Scotland College of Agriculture, page 26, and the estimated milling power compared with the meal actually obtained. Forty or fifty tests were made, and showed that, while, on the whole, there is a tendency for thin-skinned grain to yield more meal, the exceptions are striking and numerous. Reference to the last table will show that in one test Thousand Dollar had more husk than Potato, and, in the other less, though in each case Potato was the worse miller. The figures which follow are characteristic in their inconsistency.

Variety.	Estimated Percentage of Husk.	Actual Percentage of Husk.	Percentage of Meal Actually Obtained.
One Test in Aberdeenshire—			
Siberian	24·05	24·2	61·5
Wide Awake	24·95	26·2	61·3
Scots Birlie	23·31	24·8	59·8
Thousand Dollar	25·00	28·9	59·5
Averages of Four Tests in Ross-shire—			
Sandy	24·74	...	57·7
Potato	24·54	...	57·2
Waverley	23·29	...	55·7
Storm King	28·38	...	55·5
Newmarket	22·67	...	55·4

In the Aberdeenshire trials the estimated percentage of husk in the case of Siberian and Wide Awake agrees fairly well with the actual percentage found in milling; but Scotch

Birlie, with the least, produces practically the same proportion of meal as Thousand Dollar, which has the most husk. In the Ross-shire tests Storm King, with 5 per cent. more husk than Waverley and Newmarket, produces as much meal. These inconsistencies occur repeatedly—so often that one must believe that the laboratory estimate is but a poor indication of the milling power.

Do the Heaviest Oats give the Largest Quantities of Meal?—Oats of heavy natural weight are, of course, more valuable than lighter oats, as they will produce more meal per quarter; but will they give more meal per ton than grain a few lbs. lighter per bushel? The trials under consideration were not planned to deal with this question, but so far as they go they appear to show that weight per bushel is not an accurate guide to the amount of meal that will be obtained from a given weight of grain. To ascertain the effect of weight per bushel with accuracy it would be necessary to test a number of samples of the same variety, grown on the same farm from one sample of seed, and differing only in weight per bushel. This was not feasible, but it appears from the figures that varieties of the same type, grown on the same soil and of similar weight per bushel tend to approximate in meal production.

RESULTS from the same Type, Weight per Bushel, Soil and Mill.

Mill.	Variety.	Weight per Bushel.	Meal.
		Lb.	Per cent.
Denwell	Newmarket	47	59·5
	Thousand Dollar	47½	59·5
Cairnbulg	Siberian	45	61·6
	Wide Awake	44½	61·2
Tipperty	Banner	43¾	58·4
	Wide Awake	44	58·4
Echt	Newmarket	43¼	60·1
	Waverley	43½	60·1

RESULTS from different Types, but from the same Weight per Bushel, Soil and Mill.

Mill.	Variety.	Weight per Bushel.	Meal.
		Lb.	Per cent.
Cairnbulg	Siberian	45	61·6
	Potato	45	60·7
Tipperty	Waverley	44¼	61·2
	Scotch Birlie	44¼	62·5
Echt	Newmarket	43¼	60·1
	Potato	43	56·0

RESULTS from different Soils and Mills, but from the same Variety and Weight per Bushel.

Variety.	Mill.	Weight per Bushel.	Meal.
		Lb.	Per cent.
Potato	Echt	43	56·0
	Denwell	$43\frac{1}{2}$	61·9
	Tipperty	43	62·5
Scotch Birlie	Echt	$42\frac{3}{4}$	58·3
	Denwell	43	62·2
	Cairnbulg	$43\frac{1}{2}$	59·8
Siberian	Echt	$44\frac{1}{4}$	60·1
	Denwell	45	60·1
	Tipperty	44	62·2
	Cairnbulg	45	61·6

Through the kindness of Mr. James Hogarth, miller, Kirkcaldy, we have been supplied with the results of two trial grists made recently with oats weighing respectively 42 lb. and 44 lb. per bushel. Ten quarters of each were milled, and, neglecting details, it appears that the 42 lb. oats gave 56·6 per cent. of meal, and the 44 lb. sample 55·8 per cent.; but the difference can be accounted for as the heavier oats contained $1\frac{1}{2}$ per cent. more moisture than the lighter. Moisture so frequently accounts for extra weight in oats that bushel weight before the grain is kiln-dried is an uncertain guide to milling power.

What is the Effect of Soil on Milling Property?—It is well known that millers have a preference for oats from certain soils, and even from particular farms. Two of the trials throw some light on this preference. Tipperty is on a stiff boulder clay not far from the sea; Echt is on a light gravelly drift soil about twelve miles inland.

	Tipperty Boulder Clay.	Echt Gravelly Drift.
	Per cent. of Meal.	Per cent. of Meal.
Siberian	62·2	60·1
Thousand Dollar	62·8	59·5
Waverley	61·3	60·1
Scotch Birlie	62·5	58·3
Wide Awake	58·3	57·1
Potato	62·5	56·5
Newmarket	59·5	60·1
Banner	58·3	59·8
Average	60·9	58·9

Six varieties out of eight produce more meal on the clay than on the gravel, and the difference is considerable—*e.g.*, the 4 per cent. difference in favour of Potato at Tipperty means that a crop of 56 bushels per acre is worth 12*s*. to 14*s*. more to the miller than the same number of bushels grown at Echt.

General Conclusions.—The experience we have gained in conducting these experiments has convinced us that the conditions upon which the milling properties of any variety, or of different samples of the same variety, depend are many; and we have been led to draw the following general conclusions partly from the experimental evidence and partly from theory. To avoid confusion, it is convenient to consider the milling factors first, as affecting different samples of the same variety, and, second, as affecting samples of different varieties grown under similar conditions.

THE SAME VARIETY.—We conclude that the proportion of meal obtainable from oats of the same strain will vary according to two sets of causes which may be distinguished as primary and secondary. The primary causes are soil, season, manuring and dressing of grain. The secondary causes assert themselves when the primary causes have acted equally on all samples, as moisture, maturity and thickness of husk.

The Soil.—Experience shows that clay soils grow oats of high milling power, and peaty soils grain of least value in that respect. The difference is probably due to the thinner husk and better matured kernels of clay-grown oats.

The Season.—A dry season is favourable to meal production, as the grain contains less moisture and is better matured—*i.e.*, the kernel is larger in proportion to the husk.

Manuring.—Excessive nitrogenous manuring tends to thicken the husk, delay ripening and increase the percentage of water in the grain. Phosphates and potash—especially the latter—appear to increase the proportion of kernel, and certainly accelerate ripening.

Dressing.—If oats are not carefully sized or graded, loss occurs from the following causes:—(*a*) Grains of unequal size do not dry uniformly; (*b*) in shelling badly dressed samples, the larger grains are broken and the smaller escape; (*c*) very small grains are blown among the husks.

The difference in out-turn of meal between well-dressed

and badly dressed grain is much greater than is generally supposed, and sufficiently accounts for the lower price offered for mixed grain, and is probably one reason why some millers dislike samples of the newer varieties.

DIFFERENT VARIETIES.—Other things being equal, variations in the milling power of different varieties depend on (*a*) the thickness of the husk and (*b*) the shape of the kernel.

The former factor has usually concealed the importance of the latter. For example, the husk of Newmarket is actually thicker than the husk of Potato, although, as we have seen, the proportion of husk in Newmarket is less than the proportion of husk in Potato. Hence Newmarket, in spite of a thicker husk, is a better milling oat than Potato. The explanation of this anomaly is found in the shape of the kernel. Some varieties have a kernel which fills up and is closely covered by the husk; in others the so-called "fine short plump oats," the husk fits badly. There is a space between the end of the kernel and the husk. For want of a better word we have described the most economical shape of kernel as rectangular and long, and such a kernel neutralises the loss due to a thick husk. The following are examples of the various types, and given equal conditions and a good season, the order of merit from a milling standpoint would probably be as shown by the figures to the right of the name.

Thin husk—		
Long rectangular kernel	Sandwich	(1)
Moderately long kernel	Sandy Scotch Birlie	(2)
Short pointed kernel	Potato	(3)
Thick husk—		
Long rectangular kernel	Newmarket Abundance Thousand Dollar	(2)
Long pointed kernel	Banner Siberian	(3)
Short pointed kernel	Storm King Tartar King Bonanza	(4)

The combination of long rectangular kernel, with a thin husk, makes the best milling oat; and such is the first on the list. It is the shape of the kernels of Newmarket, Abundance and Thousand Dollar which enables them to compete successfully as milling oats with Potato and Scotch

Birlie. The worst combination is found in Storm King, with short pointed kernel and thick husk. The heaviest or rather the most rigorously dressed samples of Potato have a milling factor of their own in the shape of a bosom pickle of which only the pales have developed.

According to the preponderance of certain conditions, the milling property leans one way or another. It is conceivable that a very dry mature sample of Storm King, grown on a stiff clay soil, will yield more meal than a damp sample of immature Sandy from a peat; but equalise the conditions, and Storm King will be eclipsed; reverse them, and Storm King will be nowhere.

SELECTION OF RACES OF FOWLS FOR TABLE POULTRY.

EDWARD BROWN, F.L.S.

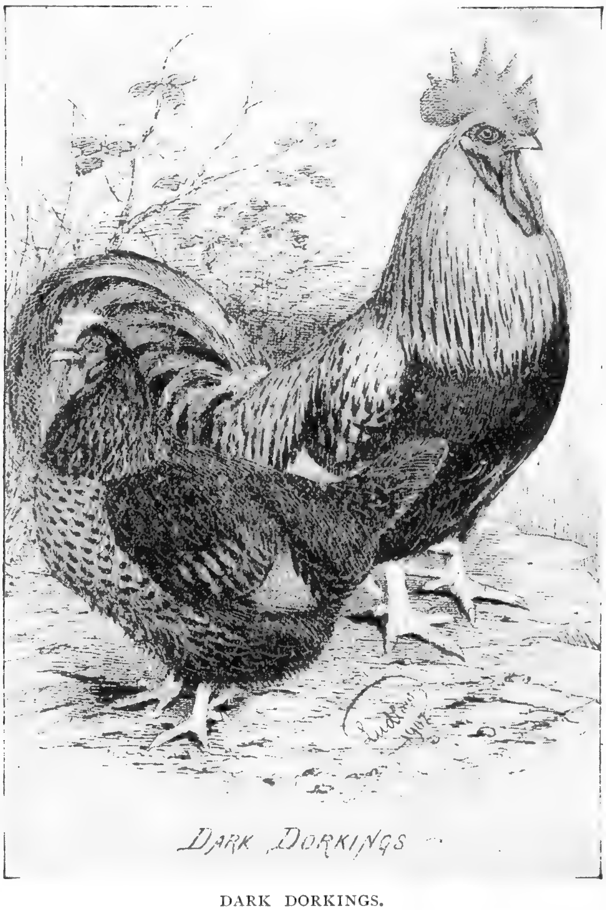
It may be accepted as a general rule that excess in any direction can only be obtained at the expense of some other quality. Specialisation is essential under the more intensive conditions of the present day, but the result is not all gain. There is sufficient evidence to show that increase of egg production is usually accompanied by a reduction, if not an entire loss, of the maternal instinct, and a diminution in the size of body. The adoption of the trap-nest system as a means of selecting the best laying hens will expedite this process, and probably lead to a more rapid exhaustion of size of body and of vigour in our races of poultry than hitherto. Whilst the system is necessary and eminently practical, it is desirable that breeders should recognise the probable result. On the other hand, increase of size and of flesh properties lead to a lessened laying capacity. Hence it is that those breeds which are valuable as table fowls can seldom show an average output of eggs at all approaching the laying races, and this is more especially true of the larger races. One or two of the smaller breeds which have considerable capacity for fattening are fairly good layers.

A considerable number of races of fowls are specially strong in meat qualities, in that the muscles found upon the sternum or breast, and upon the thighs are abundant. As a rule these breeds are fairly large in body, adult cocks weighing from 7 lb.

to 10 lb. Above this size the tendency is to develop heavy bone, which means a corresponding extension of the period of growth, increased cost of production, and lessened quality of the flesh. The best results are obtained with birds which have a well-developed frame without heaviness of bone, and upon which the meat can be increased by fattening. The heaviest-boned fowls are usually those with the longest legs, and the tendency to elongation of the limbs and neck seen in a few breeds means slower growth and lessened meat properties. Further, excess of feather has a similar influence, and means greater cost in production. Bone and feather are both essential, but are undesirable beyond what is absolutely necessary.

The structure of any animal or bird is largely influenced by the extent of use of its various organs, limbs and muscles. In a state of nature fowls fly as much as they walk, and thus the development of the wing and leg muscles is about equal, while under domestication fowls fly less and walk more. Undoubtedly the change is largely due to increase of size of body, as the wing power has not developed proportionately with the weight to be lifted. Under these conditions the constant tendency is to diminution of the size of wings, and consequently of the motor muscles, so that, if unchecked, the result would be largely to increase the leg bone and muscle and to decrease the breast meat. Such changes are evident in many breeds of fowls, more especially in the Asiatics and such as are descended therefrom, in which long legs, heavy in bone, big thighs, with small wings and breasts, are characteristic. It is not too much to say that increased size of body would always be accompanied by these changes unless the tendency were corrected by careful selection on the part of breeders. In spite of all that may be said as to the evils arising from an excessive development of arbitrary points, it speaks volumes for the practical results of poultry-breeding that breeders have, in the purely table races, maintained and developed the breast qualities against a constant tendency to reduction in that direction. We may fairly claim that the fine meat properties in our table fowls are due to definite and persistent breeding, and not to natural conditions or to chance. Recognition of the fact here explained is necessary in order to ensure a continuance of such methods in the future.

Reference has already been made to the need for a well-developed frame in table poultry, without which the quantity of flesh must be restricted. Hence the best fowls for meat are those with long, broad and deep bodies, and large wings. A short body means correspondingly limited length of muscles; a narrow body reduced width of muscles; and a shallow body relatively narrower keel and thinner muscle. All of these are



DARK DORKINGS.

found with small wings. Fattening will increase the quantity of flesh on almost all classes of poultry, but the most skilful operator cannot by this system lengthen, broaden or deepen the flesh. He can only expand it in accordance with the muscular development. Such fowls as are deficient in any of the directions indicated may be fairly good for the production of flesh, and serve a useful purpose in meeting certain market

demands, but they cannot be expected to give specimens of the higher class.

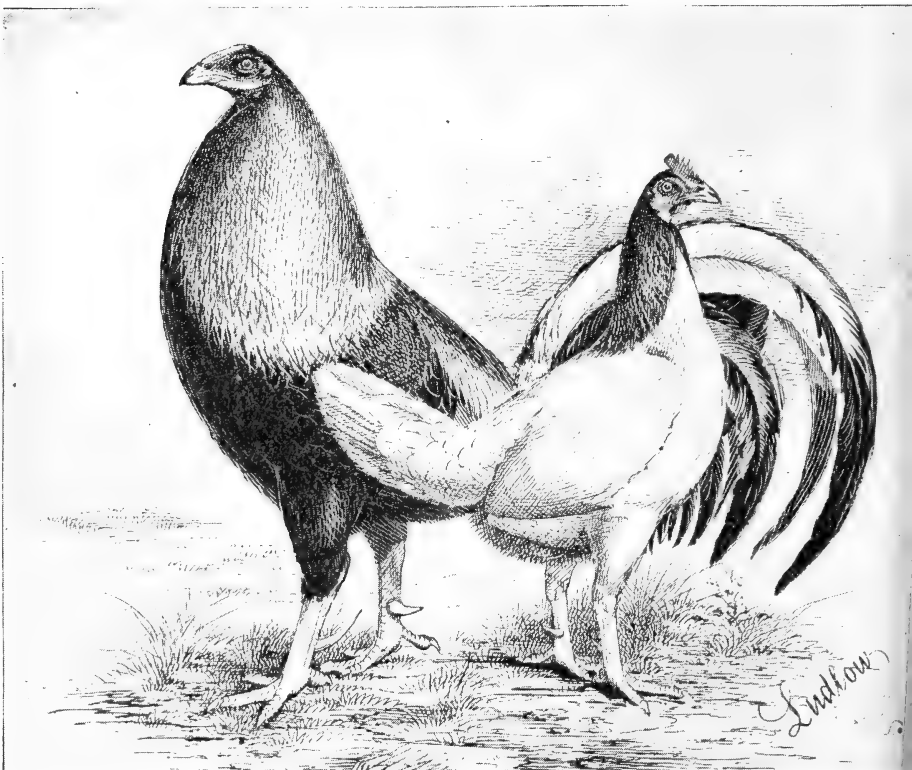
In the first-class markets it is essential that the best qualities of chickens should have white flesh and skin. From that fact it will be evident that the range of selection is limited. Upon the question as to whether white-fleshed birds are better than those with yellow flesh it is needless to dwell, for market requirements are the prime factor in determination of value, and in all the chief markets there is no doubt whatever on the matter. As might be expected, there are degrees in the whiteness of flesh and skin. Some races have a distinctly grey tone, whilst in others a creamy tint is manifest. But in all white is the ideal. To meet the demand for first-class specimens this fact must be kept in view. By a proper system of fattening, more especially if skimmed milk is employed freely, even dark or creamy-fleshed birds can be greatly improved, but the colour cannot be entirely removed. Hence, in considering the selection of races of fowls for meat, it is essential that the coloration of flesh and skin should be kept prominently forward when choice is made. Among the better known breeds which have the flesh and skin white, the following are selected as representative both of British and foreign races :—

Dorking,	Bresse,
Sussex,	Crevecoeur,
Game (some varieties),	Faverolle,
Buff Orpington,	Houdan,
Scotch Grey,	Malines.

The first five of these are British, the succeeding four are French, and the last named Belgian. There are many others, but for various reasons which it is unnecessary to explain they need not be added. The above list indicates those chiefly of practical value. Even among these there is considerable difference in the quality of the flesh, chiefly dependent on whether it is soft or hard; in this respect the Game are least satisfactory, as the muscle is hard and firm, and the birds require to be well-hung after killing. Of the ten breeds named, the following may be selected as the best :—Dorking, Buff Orpington, Bresse, Faverolle and Malines.

Upon the English market when white flesh and skin are associated with white legs, the combination is thought to be

as nearly perfect as possible, but the great majority of French breeds have dark or slate-blue legs and feet, combined with a pure white skin. That is not always, however, the case, and where the flesh and skin are grey, as in the case of the Langshan and the Black Orpington, such specimens do not attain the front rank among table poultry. The leading races which have white flesh and white legs are :—



OLD ENGLISH GAME.

Dorking,	Scotch Grey (mottled legs),
Sussex,	Faverolle,
Buff Orpington,	Game (some varieties).

Of the others named, Bresse and Crevecoeur have dark, and the Houdan and Malines pinky-white legs and feet. It may be noted that white-fleshed birds, and especially those with white legs, are unsuited to heavy soils, and in some cases do not appear to have the vigour necessary to meet such conditions.

But in addition to such breeds of fowls as may meet the

demand for finest quality birds, there is a large sale for those which do not reach that standard. This is provided for by white-fleshed birds which have not been fatted, and by yellow or dark-fleshed chickens.

Size of body counts for much more than quality in the cheaper branches of the trade. Under such conditions it would be a waste of energy to breed only the best; and as

WHITE LEGHORNS.

the yellow-fleshed races are usually hardier, and consequently easier to rear, they are in the majority in many districts. This trade is provided for to a great extent by what are known as the general purpose breeds—that is those which are fair egg producers, but at the same time carry a satisfactory amount of meat. The best, from a table point of view, are those with grey flesh and skin, and with dark legs and feet,

notably the Langshan and the Black Orpington. In these the bone is heavier than in the purely table breeds, and proportionately they have more meat upon the thighs, but the flesh is of a good quality. Among the yellow-fleshed races may be recommended the following :—

Game (some varieties),	Plymouth Rock,
Indian Game,	Wyandotte.

Of these the Game is distinctly the best in respect to meat, but farmers do not find it easy to keep these birds in large numbers on account of their fighting instincts, and they are rather small in size of body. Consequently, the Plymouth Rock and Wyandotte are found to be best adapted to meet the requirements of this trade. Indian Game carry a large amount of flesh, but it is hard and very yellow, for which reason, except in one or two markets, they are not regarded with favour. This breed is chiefly employed for crosses with soft and white-fleshed breeds, producing very fine and meaty chickens. As yellow flesh is always associated with shanks and feet of the same colour, where such crosses are made the hens used should have white flesh and legs.

Whether the production of chickens be for a high or a second class trade, crosses can be recommended if they are made for the development of meat qualities, as by this method greater vigour is obtained, and, frequently, more rapid development. The ordinary crosses intended to secure an abundance of eggs are of small service. In breeding chickens to be sold when well grown, there is nothing finer than a cross between an Indian Game cock and Dorking or Buff Orpington hens; but the birds are somewhat slow in growth by reason of the weight of bone, and do not meet the market requirements in the spring and early summer. Red or speckled Sussex are excellent, and do not need to be crossed, as they probably have a considerable amount of alien blood in their veins. Other crosses we have tried are between a Wyandotte cock and Buff Orpington hens; Plymouth Rock cock and Dorking hens; and a Faverolle cock and Buff Orpington hens. These produce a fine class of chickens, capable of full fattening. For a rougher class of bird, where colour of flesh is of small importance, there is nothing better than a cross between a Plymouth Rock or Wyandotte cock and Leghorn hens, white or black for preference.

CO-OPERATIVE HORSE INSURANCE.

W. L. CHARLETON.

Not much has been done up to the present time to apply co-operative principles in any systematic manner to the Insurance of Live Stock in Great Britain and Ireland. There are in existence certain commercial companies which have been established for the purpose of enabling owners of stock to insure their property, but these are in no sense co-operative, and the premiums do not encourage great advantage being taken of their existence by smaller farmers.

Many instances are to be found where material benefit has been derived locally by the formation of so-called "cow clubs" and "pig clubs."* In some counties, notably in Lincolnshire and Derbyshire, these are fairly numerous, and isolated instances exist from Nothumberland to Cornwall. Many of these, for the greater part "voluntary," and therefore unregistered Associations, are of quite old standing, and their formation can sometimes be traced back to the early years of last century. Unfortunately, no attempt has yet been made to co-ordinate, and bring these bodies into touch with one another. Their establishment has been due entirely to local initiative from time to time, and consequently there is much diversity of rules and methods of management. No active steps have as yet been taken to promote others, or even to foster those in existence, which it will be found have invariably been of great usefulness wherever established, especially to small holders and cottagers. On the Continent, associations for the mutual insurance of all kinds of live stock on co-operative lines are to be found organized in Federations, thus gaining in financial strength, should unfortunately an epidemic of disease occur in any one locality. The principles on which such associations are conducted ensure great economy, and thereby allow of insurance at a relatively lower rate than can be secured in this country.

Evidence that mutual insurance of one—and that not the least valuable description of live stock—can be successfully undertaken on only a small scale is furnished by the ninth Annual Report, recently issued, of the Newark Horse-keepers' Insurance Company, Limited. This undertaking,

* See "Cow and Pig Clubs in Lincolnshire," *Journal*, May, 1905, Vol. xii., p. 82.

which was originally established in or about the year 1840, was, until 1898, carried on with success as a voluntary association. In the latter year it was deemed advisable to reconstruct it, and register it under the Companies Acts, and it was therefore duly incorporated with the usual memorandum and articles of association, at a cost of about £50. Presumably, the members of the old association were ignorant of the advantages to be gained by registration under the Industrial and Provident Societies Acts, which would not have entailed this amount being expended in promotion and incorporation, and would have allowed further of even greater economy and larger profits each year.

The objects of the Association are set forth in the prospectus as follows :—

1. To provide veterinary attendance in all cases of illness to animals insured with the Company within a radius of eight miles.

2. To pay to the insurers two-thirds of the market value of the animals insured in case of death by accident or by natural causes.

The rates charged range as follows according to a definite scale: *2s. 2d.* per quarter, for an animal valued at £7 10*s.*, £5 payable at death; 5*s.* 9*d.*, for one valued at £20, £13 6*s.* 8*d.* payable at death; 17*s.* 6*d.* for one valued at £60, £40 payable at death. For animals of greater value than £60 a special rate is quoted on application. These premiums entitle the insurer to free veterinary attendance and medicine should such be required during the period covered, and members are further entitled to the services and advice of the Company's veterinary surgeon at a reduced fee of 5*s.* when purchasing a horse.

The first balance sheet issued, covering the period from 3rd March (the date of incorporation) to 31st December, 1898, shows that the enterprise began well under the new conditions with a paid-up capital of £410 in £1 shares. The directors were able to write off £32 8*s.* 6*d.* from the promotion account, and after paying over £83 10*s.* for losses incurred by members, in addition to management expenses, were in a position to declare a dividend of 6 per cent., a rate which has been consistently maintained ever since.

In 1900, a portion of the available balance and the reserve fund was credited to members in a further allotment of shares. In the following year the directors determined to make a final allotment of shares out of the balance of profit in proportion to the amounts paid in by members, when all members having a fractional part of £1 to their credit, after allotment of share or shares, were entitled to either pay the difference to make up a full share, or have such fractional sum paid over to them. The paid-up capital thus rose to £647, at which it remains.

In 1902, the directors were able to pay a bonus of 10 per cent. to policy holders, as a rebate on their premiums. This was repeated for 1903, and was increased to 20 per cent. for 1904 and 1905. At the close of last year, however, owing to the losses being the heaviest so far experienced, the bonus was reduced to 5 per cent.

The losses from year to year have been as follows :—

		Average Payments Made. £	s.	d.
1898	Six	13	4	0
1899	One	15	6	0
1900	Five	10	0	0
1901	Six	9	6	0
1902	Six	10	3	0
1903	Five	13	0	0
1904	Four	9	5	0
1905	Two	9	2	8
1906	Seven	9	10	0

The balance sheet just issued shows :—Assets : £697, cash on deposit in local bank ; ditto, on current account, £121 6*s*. 1*d*. Liabilities : Capital, £647 ; reserve fund, £115. Profit and loss account, £56 6*s*. 1*d*. During the year £208 5*s*. 7*d*. was received in premiums on account of 183 horses insured, £1 5*s*. from entrance and transfer fees, £4 7*s*. 6*d*. from sale of carcases, and £19 19*s*. 5*d*. interest from deposit account. In addition to the sums distributed as interest on capital, and in payment of bonuses, £21 was paid in directors' fees, £22 12*s*. went to the secretary and collector, £2 2*s*. to the auditor and £60 11*s*. 10*d*. to the veterinary surgeon.

Since the formation of the Association as a Company, £41 19*s*. has been paid as income tax, which would have remained to augment profits had the members in 1898 registered under the Industrial and Provident Societies Act. An association

so registered could have continued to increase its capital to any extent, and strengthened its position by placing the sums paid out as bonus to increase the members' share capital. The number of members now stands at 121, the market value of the horses insured at £3,505, and the claimable value at £2,336 15*s.* 4*d.*

There is no reason why associations for a similar purpose should not be as successful and beneficial elsewhere, to a community comprising gentry, tradesmen, farmers, large and small, and cartmen. Such constitute the membership of the Company.

In the Agricultural Organisation Society horse-owners have now a means whereby they may be assisted in the formation and development of such associations, which should be federated for mutual support, and to secure better investment of capital. The Newark Horsekeepers' Insurance Company, Limited, shows what can be done locally on small capital with capable control and management.

Establishment of Small Holdings on Crown Lands.

Under the Crown Lands Act, 1906, the President of the Board of Agriculture and Fisheries became ex-officio a Commissioner of Woods and Forests, and on the 27th December, 1906, the Lords of the Treasury issued a warrant placing under his management as from 1st January, 1907, the principal agricultural estates of the Crown. Lord Carrington has now issued as a Parliamentary paper (H.C. 253), his first report on the steps taken in dealing with these estates since he became Commissioner.

At the date of the report of the Commissioners of Woods for the year to 31st March, 1906, the agricultural lands, amounting to about 60,363 acres, were divided among the following holdings :—

9	Farms of 1,000 acres and upwards.	
8	,,	750 to 1,000 acres.
25	,,	500 to 750 ,,
53	,,	250 to 500 ,,
40	,,	50 to 250 ,,
44	Small Holdings of 5 to 50 acres.	
285	acres let in allotments of less than 5 acres.	

It may be remarked that in several instances the Crown farm tenants occupied farms belonging to other land owners in addition to their Crown farms. It will be observed that out of a total area of 60,363 acres, the letting of small holdings by the Crown numbered 44, which includes four small holdings let not to small holders but to farmers who held other land in addition. On the other hand, in certain cases parts of the larger farms were sub-let by the Crown tenants as small holdings at enhanced rents.

The principal object of the transfer to the President of the Board of the management of these lands was to inaugurate a different policy to that hitherto adopted in their management, and to encourage the establishment of small holdings wherever possible. To attain that object Lord Carrington considered it essential that the agents and receivers for this property should not only be in full sympathy with the policy but should also have complete practical knowledge of the adaptation of land for small holdings, and a thorough experience of the management of that class of tenants. In these circumstances, the Lords of the Treasury have appointed Messrs. J. Carter Jonas and Sons, of No. 8A, Whitehall Place, London, and Cambridge, as agents or Crown receivers for the estates so transferred.

The general instructions given to the new Crown receivers are that they should promote in every way practicable the establishment of small holdings and discourage the consolidation of the farms in their management. They have therefore been informed that opportunity should be given to parish councils and other local authorities to rent any lands within their jurisdiction which may become vacant or which can be obtained from the existing tenants by mutual agreement, and that wherever possible every cottage tenant on the Crown property should be allotted at a fair rent a piece of land commensurate with his means, beginning with not less than 20 poles or a quarter of an acre. Lord Carrington wishes the labourers on the Crown estates to understand that if they prove satisfactory tenants of such allotments they will be given the opportunity to hire more land from the Crown should they desire to increase their holdings.

At the same time he desires to make it clear that no whole-

sale interference is proposed with existing Crown tenants who are farming their land well, and it is hoped that sufficient land for the above purposes can gradually be obtained owing to natural vacancies or by friendly agreement.

In furtherance of the policy proposed to be adopted, steps have been taken to make known the desire to meet *bona fide* demands for small holdings and allotments in the neighbourhood of the Crown estates, so far as may be reasonably practicable, and the following circular letter was issued to the chairman of each county, district, and parish council in whose districts the agricultural property of the Crown is situated :—

Allotments and Small Holdings.

Office of Woods, &c.,
1, Whitehall Place, S.W.,
30th April, 1907.

SIR,

LORD CARRINGTON, as Commissioner of Woods and Forests, directs me to ask you to kindly make enquiries and inform me of any demand there may be for allotments or small holdings in your locality.

Lord Carrington will be glad, should there be a genuine demand, to endeavour to arrange, if it can be done without undue disturbance to sitting tenants, to utilise portions of the Crown lands in the district of your council that may be found to be suitable, for the purpose of allotments and small holdings, and your kind co-operation in the matter will be appreciated.

I shall be obliged if you will be good enough to bring this matter before your council, and let me hear from you at an early date.

It will be of service if information concerning applicants can be supplied on the accompanying forms.

I am, Sir, your Obedient Servant,
(Signed) FREDK. HELLARD.

To the Chairman.

As a result of the issue of this circular, and in consequence of the public attention which has been called to the matter, a very large number of applications for small holdings has been received from most of the districts where Crown land is situated. Whenever the applicants have, *prima facie,* seemed to be worth consideration, they have been asked to fill up a form giving the particulars of their experience and the amount of capital, if any, which they have at their disposal, and it is clear that there are a very large number of men who seem likely to make excellent small holders among those who have sent in applications for land.

The extent of the demand is indicated by the fact that, leaving out of consideration the numerous applications from

men who do not specify at all the locality in which they desire land, or the quantity desired, Lord Carrington has received applications for nearly 10,000 acres of land. That the demand is fairly general is shown by the fact that 4,518 acres are desired in Lincolnshire, 2,347 acres in Yorkshire, 1,074 acres in Cheshire, 690 acres in Oxfordshire, 248 acres in Bedfordshire, 175 acres in Wiltshire, 123 acres in Norfolk, and 105 acres in Kent.

It must necessarily be a gradual process to satisfy this demand in view of the necessity of avoiding any undue interference with the existing tenants, but it is hoped that by next Michaelmas upwards of 2,000 acres will have been let in different parts of the country in small holdings, and the process will be continued as opportunity offers wherever it is practicable.

In view of the fact that there has been a certain amount of misapprehension as to the extent of the land belonging to the Crown which is in hand, it may be well to state the actual position. At the date of the last report of the Commissioners of Woods, the area of the agricultural lands in hand comprised 3,494 acres, made up as follows :—

	Acres.
Burwell, Cambridgeshire	917
Potter's Hill, Oxfordshire...	490½
Wingland Marsh, Lincolnshire	357
Neat's Court, Isle of Sheppey	1,157½
Shimpling, Suffolk...	572
	3,494

During the past year the farm at Burwell has been let for small holdings, and Potter's Hill Farm still remains in hand. The 357 acres of grass land at Wingland, though technically in hand, actually produces a considerable return to the Crown, as the grazing is let annually in small lots, the gross rent receivable for the present year being £1,274. This is clearly the best method of managing this property, and the land is not suitable for small holdings. Certain portions of the Neat's Court Farm have been let, reducing the area in hand to 925 acres, and the farm at Shimpling, which had been in hand for 14 years, and which was unsuitable for small holdings, has been let to a farm tenant. At the present moment,

therefore, there are only two farms, comprising 1,485 acres in all, for which tenants have not been found, and in these cases negotiations are in progress for letting the whole or part of them. It is doubtful whether either of these farms is particularly well adapted for small holdings, but it is hoped by the date of the next report that tenants will have been found for at least a considerable proportion of them.

Reference was made last year in the report of Mr. Horner, one of the Commissioners of Woods, to the negotiations which were then in progress for letting the Crown farm at Burwell, Cambridgeshire, for small holdings. This letting was duly arranged, and the land handed over before Lord Carrington was vested with the charge of the Crown agricultural estates; but as the transaction has attracted considerable public attention, information on the subject is included in the report. The farm in question, which comprises 917 acres and includes an excellent large farmhouse, two small farmhouses, and 15 cottages, is situated in or adjoining the village of Burwell, which has a population of nearly 2,000, and is within 4 miles of the market town of Newmarket. There are two railway stations within a mile of different parts of the farm.

The estate is divided practically into three blocks :—

1. Pitts Farm and Slade Farm comprising about 479 acres adjoining the village of Burwell, about 34 acres of which are old pasture and 20 acres grass recently laid down. Nearly the whole of this land is thin white land on a chalk subsoil of good quality for white straw crops, beans, peas, clovers and sainfoin, but it is of a sticky nature, and for this reason not the best land for wintering sheep.

2. Ness and Broads Farm of 335 acres situate half way between the villages of Burwell and Fordham, including about 73 acres of grass, principally of poor quality, part having been recently laid down. About a third of the arable land is white land of somewhat similar nature to the Slade Farm above referred to, and the remainder is skirt and fen land varying from good quality mixed soil to black fen land of moderate quality.

3. A fen farm of 102 acres adjoining Reach Lode, formerly arable but now in poor fen grass. The fen land is capable of

growing substantial crops of roots, oats and rye grass, rye cut green and tares.

The two larger farms adjoin main roads. The water supply is satisfactory, and the farm buildings substantial. There is a drainage rate of 7*s*. per acre on all the fen land, comprising about 300 acres, and a tithe rent charge of about 8*s*. per acre on the remaining portion of the estate.

This farm became vacant at Michaelmas, 1904. No tenant could be found to take it as a whole, and the Commissioners of Woods and Forests were therefore compelled to farm it themselves. The farming accounts for those two years show an actual loss of £690 17*s*. 3*d*. without allowing for rent or the fees paid to the Crown receivers for superintendence. Early in 1906 Mr. C. D. Rose, M.P., for the Newmarket Division, who was anxious to try the experiment of establishing small holdings on inferior land, applied to take the farm for that purpose, and it was eventually let to him on lease for 21 years at a rent of £700 a year, subject to his paying the land tax and drainage rates, and keeping the houses and buildings in repair. This rent was certified by the late Crown receivers as being such as the farm was worth to let in the open market. The Commissioners on their part agreed to put the buildings into satisfactory repair, and they have expended £1,055 12*s*. 6*d*. on this account. In addition they have up to the present spent just under £1,800 in adapting and altering the houses and buildings to fit them for small holding tenants.

This sum has been expended as follows :—

	£	*s*.	*d*.
New fencing	192	7	9
One new homestead...	80	17	6
Alterations and additions to five other homesteads ...	802	0	0
Altering and adding to nine cottages, providing dairies, extra bedrooms and outbuildings	723	16	6
	£1,799	1	9

Mr. Rose as lessee has agreed to pay 4 per cent. per annum on the outlay in alterations and improvements in the shape of additional rent, and the rent he is charging to his subtenants is sufficient to cover the full rent and outgoings together with interest and sinking fund on all outlay and a sufficient margin for expenses of management.

The farm has now been sub-divided by Mr. Rose, and let to 75 tenants as follows :—

48 allotment holders occupying under five acres each.

13 small holders occupying 5 to 15 acres each.

12 small holders occupying 30 to 78 acres each.

1 small farm of 102 acres.

The large farmhouse and 45 acres have been let to an adjoining farmer.

Eleven out of the twelve small holders, who occupy between 30 and 78 acres, are living in the houses on the farm, and the remaining tenants live in the village of Burwell. A statement giving some description of the present tenants of the farm has been prepared by Mr. J. H. Diggle, who acts as Mr. Rose's agent in respect of this farm, and, as it gives an interesting indication of the class of men from whom the demand for land largely comes, it is printed as Appendix II. to the report.

The amount of the valuation due from the incoming tenant was £2,205 6*s.* 7*d.* and the sum has been apportioned among Mr. Rose's sub-tenants, with the exception of £175 9*s.* for fixtures which has not been actually paid to the Crown, but on which Mr. Rose pays interest instead.

By Lord Carrington's directions an inspection of the estate has recently been made by the Crown receivers, and they report that although the "white" land is not the most suitable for the purpose of small holdings, there appears every prospect of the enterprise being a success. They consider that the land has been divided to the best advantage, and that the tenants have been selected with judgment, and include men who are bound to succeed as small holders. They further report that with regard to the small holdings, their success on the class of land, which is principally arable, will depend a great deal on the tenants rearing and keeping as much stock as possible to enable them to make plenty of manure. They found that considering that the tenants had only taken possession last Michaelmas and had each to pay a share of the tenant right valuation and other expenses in providing implements, &c., the amount of stock they had was very satisfactory, and they were satisfied by their inspection that the land was being properly cultivated and managed.

The tenant of a farm of 245 acres at Bromham in Wiltshire found he was unable to continue his tenancy, and asked to be released. As there was a demand for small holdings in the locality, the farm was offered to the parish council for the purpose, and they have taken it at a rent of £150, and have sub-let it in small parcels. Nothing has yet been spent by the Crown on equipment, but it is estimated that about £75 will be required for sub-division of fields. In the case also of Woodlands Farm, at Northstead, near Scarborough, comprising 152 acres, the tenant was unable to continue, and the farm was offered to and accepted by the local authority for future development in small holdings.

Another farm at Northstead has been let to the local authority from Michaelmas next. This farm of 327 acres has been held for twenty-one years by two clergymen who have sublet it (partly in small holdings) at a profit. The tenancy has been terminated by notice, and the land is to be let to the local authority for small holdings on the condition that a profit is not made out of the letting.

A change of tenancy at Michaelmas next of a farm containing 944 acres at Wingland, Lincolnshire, having become necessary through the death of the tenant, 565 acres of it has been taken towards satisfying a large demand for small holdings which exists in the locality, and other Crown tenants have agreed to give up land at Michaelmas for the same purpose.

Workmen's Compensation Act, 1906.

The Home Office has now issued a memorandum on the Workmen's Compensation Act, 1906, which may be purchased at any post office, price one halfpenny. The memorandum states briefly and in plain language the main provisions of the Workmen's Compensation Act, 1906; but it must not be taken as rendering unnecessary a careful study of the provisions of the Act itself.

Some of the principal points dealt with are given below.

Object of the Act.—The object of the Workmen's Compensation Act, 1906, is to make some provision for employees who through accident arising out of and in the course of their employment are disabled from earning their ordinary wages, or if the accident results in death, for any persons who are

dependent on the deceased. To effect this object, the Act makes the employer liable to pay compensation for such accidents. If the accident causes permanent or temporary disablement, the compensation will be in the form of weekly payments to the injured person while the disablement lasts; if the accident results in death, the compensation will be a lump sum to be applied for the benefit of such members of the family of the deceased as were dependent upon his earnings at the time of his death.

The Act does not require employers to insure against these liabilities, but it is advisable that any employer who would find it difficult to meet the heavy charge which might be entailed upon him by a serious accident, should protect himself by insurance with a sound insurance company.

Relation of the Act of 1906 *to the Acts of* 1897 *and* 1900.—The Act of 1906 came into force on the 1st July, 1907, and, as regards accidents happening after that date, supersedes the previous Acts of 1897 and 1900. The new Act makes many important changes. The previous Acts were limited to employment in certain specified and for the most part dangerous industries; the new Act embraces, subject to certain specified exceptions, employment of every description. The previous Acts compensated only for injuries lasting more than a fortnight; the new Act compensates for all accidents lasting more than a week. Lastly, the new Act sweeps away the restrictions which limited compensation to accidents happening *on, in, or about* the premises of the employer, and, as regards agriculture, to cases where the employer *habitually* employed one or more workmen.

Injuries to which the Act applies.—There are two classes of injury for which compensation is payable under the Act: (i) injury by accident; (ii) injury to health from industrial disease. As regards injuries by accident the Act lays down the following conditions:—

(*a*) The accident must arise out of the employment, *i.e.*, it must be directly due to the injured person's employment, and it must also happen in the course of the employment.

(*b*) The injury must disable the injured person for a period of at least one week from earning full wages at the work at which he was employed.

(*c*) If the injury is proved to be due to serious and wilful misconduct on his part, no claim to compensation is to be allowed unless the injury results in death or serious and permanent disablement.

Persons entitled to Compensation.—The Act applies to any "workman," but the term "workman" is used in a special sense, being defined to mean "any person who has entered into or works under a contract of service or apprenticeship with an employer, whether by way of manual labour, clerical work, or otherwise, and whether the contract is expressed or implied, is oral or in writing." This definition is very wide and may be said to cover every case in which two people stand to each other in the relation of master and servant. But a few classes of persons are by the Act expressly excluded. These are as follows :—

(*a*) Persons not employed in manual labour whose remuneration exceeds £250 a year. Thus clerks, school teachers, &c. who are not "manual labourers," are excluded if they are earning more than £250 a year.

(*b*) Any person whose employment is of a casual nature and who is employed otherwise than for the purposes of the employer's trade or business.

If may be difficult in particular cases to say whether a workman who has been given a casual job, has or has not been employed for the purposes of the employer's business; but, as a rule, the question should be easily answered. For example, when a dock labourer is engaged by a dock company to help in the unloading of a ship, his work may be of a casual nature, but he is employed for the purposes of the company's business, and is therefore within the Act while so employed. Again, the extra hands whom a farmer engages for haymaking or harvesting are employed casually, but their employment is for the purposes of the farmer's business, and they will therefore come within the Act. On the other hand, a boy who is engaged by the ordinary traveller to carry his bag or other personal luggage to or from the station, or a tramp engaged out of charity to clear away snow from the door-steps of a dwelling-house, could not be said to be employed for the purposes of the employer's trade or business.

(*c*) Any member of a police force for whom provision is made in other Acts.

(*d*) Any "outworker" *i.e.*, a person to whom articles or materials are given out to be made up, cleaned, washed, altered, ornamented, finished or repaired, or adapted for sale, *in his own home or on other premises not under the control or management of the person who gave out the materials or articles.*

(*e*) A member of the employer's family dwelling in his house.

The Person liable to pay Compensation.—In the case of injuries by accident, the person liable to pay compensation is the employer, and he continues liable when he temporarily lends or lets on hire the workman's services to another person.

Special provision is made in section 4 with regard to *sub-contracting.* Roughly, the effect of the section may be said to be that where the workman is engaged on work which has been sub-let to his employer by another person, called in the Act "the principal," the workman is given the option of claiming compensation either from his own employer or from the principal. An example may be taken from the building trades, where the section is of special importance. If a builder who has undertaken in the course of his business to build and decorate a house, sub-lets the decoration to another firm, a workman employed by the latter firm would, if injured by accident *while employed on, in, or about the building,* be entitled to claim compensation *either* from his own employer, *i.e.*, the decorators, *or* from the principal, *i.e.*, the builder by whom the work of decoration was sub-let. In such a case, however, the principal, if called on to pay compensation to the workman, is entitled to recover the sum paid from the workman's own employer, the contractor.

An exception to the above rule is made in the case of certain contracts for agricultural work. Where a person contracts with a farmer to do threshing, ploughing or other agricultural work, and, in order to execute the work, provides and uses machinery driven by mechanical power, he alone will be liable to compensate the workmen whom he employs. No claim can be made against the farmer by the contractor's workmen.

Amount and Payment of Compensation.—

(1) *Injuries resulting in Death* :—

(*a*) If the workman leaves any person wholly dependent upon his earnings, the compensation is to be £150 or three years' earnings, whichever is the larger, up to a maximum of £300.

By "three years' earnings" is meant the amount earned by the workman in the employment of the same employer during the three years immediately preceding the injury, or if the workman has been employed less than three years, a sum equal to 156 times his average weekly earnings in that employment.

If some time elapses between the date of the injury and the date of death, any compensation paid to the workman in the interval is to be deducted from the amount due to the dependants.

(*b*) If the workman leaves persons partially dependent, the compensation is to be such sum, not exceeding the amounts specified under (*a*), as will be reasonable and proportionate to the loss sustained by such dependants.

(*c*) If no dependants are left, then the reasonable expenses of medical attendance and burial are payable up to a maximum of £10.

It is important to notice that in all cases in which dependants are left, the compensation must not be paid by the employer direct to the dependants, but must be paid into the county court. The court will invest, apply or otherwise deal with the money in such manner as it thinks best for the benefit of the dependants.

(2) *Injuries resulting in Disablement* :—

(*a*) If the workman is totally disabled, the compensation will be a weekly payment while the disablement lasts, which is not to be more than half his average weekly earnings, or to exceed £1.

No compensation is payable for the first week, if the disablement lasts less than two weeks.

No compensation is payable at all for injuries which last only a week or less.

(*b*) If the workman is only partially disabled, the weekly payment must not exceed the difference between what he

was earning before the accident and the amount he is earning (or is able to earn in some suitable employment or business) after the accident, but is to "bear such relation to the amount of that difference as under the circumstances of the case may appear proper." Thus, if a workman who has been earning £2 a week, gets £1 a week compensation while totally disabled, the £1 must be reduced to at least 10*s*. as soon as he is so far recovered as to be able to earn 30*s*. in a suitable employment. Otherwise his compensation and weekly earnings together would amount to more than the £2 which he was earning before the accident. If, however, he only recovers sufficiently to earn £1 a week, no definite rule is laid down as to reducing the amount of compensation; the amount will be a matter to be settled, by agreement between the parties or by the arbitrator, according to the circumstances of the case.

In fixing the weekly payment, any payment, allowance or benefit which the workman may receive from the employer during his incapacity, is to be taken into account.

There is a special scale in the case of a workman who is under 21 years of age at the time of the injury. If his average weekly earnings were less than £1, the weekly payment awarded may be any sum up to 10*s*., *e.g.*, if his wage is 14*s*., he may under this scale get 10*s*. instead of 7*s*. a week. Further, if the disablement last more than twelve months, the weekly payment may be increased, on the application of the workman, to half the weekly sum which he would probably have been earning at the time of the application if he had remained uninjured, subject to a maximum of £1.

Notes on Insect, Fungous, and Other Pests.*

MOTHS.—Two caterpillars which attack fruit trees were forwarded from Knutsford (Cheshire), one being that of the Figure-of-8 Moth (*Diloba coeruleocephala*) mentioned in this *Journal* for July, p. 213, and the other the Brown Tail Moth (*Porthesia chrysorrhœa*). This caterpillar may be combated by the measures recommended in Leaflet No. 69 (Tent Caterpillars). Special attention

* Notes on insect, fungous and other pests, dealing with the specimens submitted to the Board for identification and their apparent prevalence, will appear in this *Journal*, month by month. (See also *Journal*, June and July, 1907.)

is drawn to the arsenate of lead solution at p. 7 of the leaflet, the words of which may be taken to read "Dissolve 1 oz. of *anhydrous* arsenate of soda in warm water, and add it to 16 gallons of soft water. Then dissolve 3 oz. of acetate of lead in water and pour it into the 16 gallons of liquid. Add to this 2 lbs. of treacle."

The caterpillars of *Anarta melanopa*, the Broad-bordered White Underwing Moth, were received from Lerwick (Shetland Isles). This moth was first discovered in Britain in the Shetland Isles and later at Rannoch. It has also been found in the Alps, the Tyrol, and in Norway. The moth has brown forewings densely speckled with black and white; the hind wings are white. The caterpillars feed on *Vaccinium*, *i.e.*, the blaeberry, cowberry, &c., and are not economically harmful.

Tortrix Moths.—Specimens of Tortrix caterpillars were received from Grantham, Wigton, and Lympstone (Devon.) Among them were specimens of the Pith Moth (see Leaflet No. 90). Dead shoots should be hand-picked and burnt before the moths issue. The spray recommended in the leaflet as likely to be of service against the young caterpillars of the Pith Moth would be useful and would have the further advantage of reaching, in the late summer, the caterpillars of another Tortrix, viz., the Bud Moth.

Among other moths or their caterpillars submitted were the Eyed Hawk Moth (*Smerinthus ocellatus*) from Howden, which was described in this *Journal* for July, p. 213; the Magpie Moth (*Abraxas grossulariata*) from Elgin and Aberdeen (see Leaflet No. 20); and Surface caterpillars (Leaflet No. 33) from Norfolk.

BEETLES.—"Strawberry beetles" have done much damage at Norwich and Reigate. Specimens forwarded from Reigate in July, 1906, included *Pterostichus* (or *Steropus*) *madidus* and the slightly smaller *Harpalus ruficornis*. These beetles appear to be doing considerable damage this season. From Norwich the specimens sent included *P. madidus*, and *Calathus cisteloides*. These, together with *H. ruficornis* and *Omaseus* (or *Pterostichus*) *vulgaris* may prove very destructive to strawberries. The beetles hide in the daytime in the litter, in earth-runs, &c., and come out to feed at night. *Harpalus*

is a winged form, which can migrate; the other three species are wingless but can run actively.

The above beetles are ground beetles belonging to the family *Carabidæ*, the majority of the members of which are predaceous and carnivorous in diet, not vegetarian. Being partly scavengers they are sometimes trapped by baits of flesh covered with sacking. The most serviceable treatment, which has been recorded as successful on a large scale, consisted in letting into the soil at intervals of a few yards cheap pudding basins sunk to the ground level. In these were placed sugar-water and pieces of lights. On dry nights as many beetles as would half fill the basins were caught. By continuing this treatment the pests were reduced until but two or three were trapped, and later none. Sacking if spread here and there in the strawberry beds would be used as shelter places by the beetles; this might at fixed intervals be shaken into paraffin or boiling water. On a small scale the straw covering the beds might be removed in successive portions, the soil turned over with a trowel, and the sheltering beetles collected. Unfortunately no spray or dressing can be used with success against these beetles.

Green Rose Chafer.—Another beetle with a bad record for its attacks on strawberries is *Cetonia aurata*, the Golden Chafer or Green Rose-Chafer. This beetle, sometimes in great swarms, attacks the blossoms, eating the flower parts so that no fruit follows. In some years whole beds are thus destroyed. The only method of combating this beetle in its adult stage is by collecting the beetles in dull weather, when they are sluggish. The beetle lays its eggs in cracks in the ground, the grubs gnawing the roots, so that *Cetonia* is harmful both as larva and in its adult form. (See also Leaflet No. 25, Chafer Beetles or White Grubs).

Carabus Beetle on Mangolds.—Beetles found to be attacking mangolds in Cheshire were identified as *Pterostichus* (or *Steropus*) *madidus*, mentioned above in connection with strawberries. The best remedial measure is to spread sacking in the field to trap the beetles as already suggested.

Another Carabus beetle, *Harpalus aeneus*, not reported to be harmful, was sent from Rugeley.

Weevil on Cabbages.—Specimens of cabbages from Witham, Essex, were found to be attacked by the grub of a weevil of the genus *Baridius*. This genus includes the Cabbage Stem Weevil, an insect which is rarely found very harmful. The beetles lay their eggs on the stems and in the leaf-axils, and the maggots on hatching tunnel into the stem, &c. Practically nothing is known as to the harm caused in this country by *Baridius*, and nothing can at present be recommended in the way of treatment except pulling up the infested plants and burning them with the enclosed larvæ. The plants should not be left lying about or the larvæ may escape, but should be collected in pails and at once destroyed.

Amongst specimens of galled willows (see below) one larva of the beetle *Galeruca lineola* was found. Should this pest appear in numbers the willows should be sprayed with Paris green or arsenate of lead. Other beetles and their larvæ submitted for identification were wireworms (see Leaflet No. 10) attacking potatoes at Prestonkirk, and in Lincolnshire; the larvæ of Chafer Beetles (Leaflet No. 25) attacking mangolds at Mildenhall; a chafer beetle (probably *Phyllopertha horticola*) attacking pears at Lydney; and the Apple Blossom Weevil (Leaflet No. 15) from Wigton.

FLIES.—The Frit Fly appears to be widely distributed this season, and specimens taken from badly-attacked fields of oats were sent from Southampton, Swanley Junction, Broxbourne, Castle Hedingham, and Malmesbury. An account of the fly appears on p. 297 of this *Journal*, and a leaflet on the subject is in course of preparation. Many farmers describe the attack of this pest as "bottling" of the oats.

Cabbage Root Fly.—Specimens of this pest were received from South Lincolnshire, where much damage was being done to cabbages. A full account of the fly is given in Leaflet No. 122. The second measure recommended in the Leaflet has justified itself in the United States of America, but in Ireland has, according to Carpenter, "proved uneconomical." In conjunction with this insect wireworms and millipedes (Leaflet No. 94) were attacking the plants.

The Pear Midge (*Diplosis pyrivora*), described in Leaflet No. 53, was sent from Chepstow, and "leather-jackets"

or the grubs of Daddy Longlegs (see Leaflet No. 11), which were infesting potatoes, from Brigg.

APHIDES.—Many specimens of aphides have been received. Apple trees especially appear to be infested, specimens arriving from Dorking, Ealing, Stroud, Heathfield, Witham, &c. Other specimens included the aphis on silver fir and the Plum Aphis from Exeter, aphides on cherry trees from Stroud, on currants from Stroud, Ealing, and Liverpool, and on gooseberries from Northwood (Middlesex) and Liverpool. Aphides were also present on cabbages sent from Witham, but the chief damage was done by the weevil *Baridius* mentioned above. Aphides or Plant Lice are dealt with in the Board's Leaflet, No. 104, the Woolly Aphis in Leaflet No. 34, and Currant Aphides in Leaflet No. 68.

Larch Aphis.—From Norwich came a report of young larch trees suffering from a severe attack of the Larch Aphis, a full account of which will shortly be given in this *Journal.*

It may here be noted that the small greenish larvæ or maggots of the Hover Fly (*Syrphus*) were found with several of the above specimens. These larvæ are exceedingly useful as they feed greedily on the aphides. They are mentioned in Leaflets 104 and 68, while they were more fully dealt with in this *Journal*, Vol. V., No. 3, December, 1898, p. 328.

SAWFLIES.—Specimens of the Gooseberry and Currant Sawfly, *Nematus ribesii* (see Leaflet No. 12) were received from Stonehaven and from New Pitsligo (Aberdeen).

Sawfly on Willows.—Specimens of galled willows forwarded from South Patterton (Somerset) were found to be infested with a sawfly, *Nematus gallicola*, which lays its eggs on various species of willow. Galls are induced on the leaves by the pricking of the buds by the sawflies. The caterpillars which hatch from the eggs feed inside the galls, and when full grown leave the galls and pupate in the soil. There may be two broods in the year, the first sawflies issuing in May and laying the eggs which, in due course, after the larval and pupal stages, result in a second brood in August and September. Unless the galls occur in overwhelming numbers the trees attacked do not suffer much. *Nematus gallicola* is partly kept in check by Ichneumon parasites (see *Journal*, Vol. V., No. 3, December, 1898, p. 332).

VARIOUS PESTS.—A number of other specimens were sent for identification, among them being the Brown Lecanium Scale, forwarded by correspondents from Liverpool (where it was infesting apple trees), and from Canterbury, where it occurred on damson and plum trees. A short note on this pest was given in this *Journal* for June last, p. 162. Red spiders (see Leaflet No. 41) were sent from Northwood, eelworms (Leaflet No. 46) in oats from Newbury, Southampton and Leeds, and millipedes (Leaflet No. 94) from Llandudno.

WORMS.—Two correspondents enquired as to the best means of ridding bowling greens of worms, which were causing great annoyance. On lawns, greens, &c., where worms are troublesome, a worm-killer recommended by Mr. A. D. Hall has been reported as excellent. This consists of :—Mercuric perchloride, 10 lb. (this is poison and must not be left about); hydrochloric acid, 4 lb.; and water, 6 lb. The mixture should be diluted for use in the proportion of ½ oz. of the fluid to 3 gallons water. Watering the grass with soap suds will also bring the worms to the surface, when they may be swept up.

FUNGI.—The plants infested with fungous diseases which have been sent to the Board for identification and report have been very varied.

Fungus on Gooseberries.—Shoots of gooseberry bushes from Brentwood had been killed by *Botrytis cinerea*, the summer condition of *Sclerotinia sclerotiorum*. The shoots are infected when very young and tender, and spraying should therefore commence when they are first commencing to grow. The spray should consist of ½ oz. of liver of sulphur (crude potassium sulphides) dissolved in a gallon of water. (See also Leaflet No. 127, Sclerotium disease).

Fungus on Willows.—Leaves of willows from South Patterton were infested with a fungus (*Melampsora*) causing rust. Such leaves should be burnt in order to destroy the spores and prevent them passing to other plants.

Strawberry Mildew.—Diseased strawberry plants from Botley were attacked by Strawberry Mildew (*Sphaerotheca castagnei*, Lév.). In a case of this disease the beds should be mown after the fruit is gathered, and when the leaves are dry the beds should be covered with a sprinkling of straw or other light litter and burnt over. This will destroy the

diseased leaves, and also spores lying on the ground. As the disease usually appears first on the under surface of the leaves, and from thence passes to the fruit, the foliage should be thoroughly dusted with a mixture of two parts of flowers of sulphur and one part of lime. A first dusting should be applied just as the leaves are expanding, and a second dusting just before the flowers open. (See *Journal*, November, 1906, p. 498).

Diseased Thistles.—From Malvern the Board received specimens of diseased thistles, which were infested with the rust *Puccinia suaveoleus*, Rostr. This rust is confined to thistles, which, however, it unfortunately does not kill. The mycelium of the fungus hybernates in the root-stock of the thistle, and a root-stock so infested means that the plant is thereafter always diseased but not killed.

Other fungi identified were Sclerotium disease (see Leaflet No. 127) on tomatoes from Belmont (Ayr); European Gooseberry Mildew (Leaflet No. 52) from Maidstone; Potato Disease, *Phytophthora infestans* (Leaflet No. 23), from Chepstow and Hayward's Heath; Apple Canker, *Nectria ditissima* (Leaflet No. 56) from Plymouth, Shrewsbury and Dolton (N. Devon); Peach Leaf-Curl, *Exoascus deformans* (Leaflet No. 120), and Brown Rot of Fruit, *Sclerotinia fructigina* (Leaflet No. 86) from Briningham (Norfolk); Coral Spot Disease (Leaflet No. 115) from Barnstaple; Silver Leaf (see *Journal*, July, 1907, p. 221) from Tunbridge Wells; and Onion Mildew, *Peronospora schleideni* (Leaflet No. 178) from Micheldever.

"*Fairy Rings.*"—A Doncaster correspondent enquires how "Fairy Rings" may be destroyed on grass land. It may be remarked that in Dr. Gilbert's experience Fairy Rings grow chiefly on impoverished soil. Infested grass land therefore which is at all poor in character should be liberally manured, and when the grasses have become more vigorous the Fairy Rings will probably disappear. In the case of lawns and special grass plots 1 ton of slaked lime might be applied in winter, 3 to 4 cwt. of superphosphate, 3 cwt. kainit, and ½ cwt. nitrate of soda in early spring, and 1 to 2 cwt. superphosphate and 1 cwt. nitrate of soda in late spring—all per acre. For pastures 4 cwt. superphosphate and 2 cwt.

kainit may be applied in early spring and ½ cwt. nitrate of soda early in April.

Gummosis.—Specimens cut from a cherry tree and sent from Bromsgrove were affected with a disease known as gummosis. This disease is caused by a fungus which first attacks the roots and upsets the physiological balance, resulting in the formation of an excess of gum in every part of the plant. No remedy is known for gummosis, but diseased trees should be removed and burnt. It is most important that the root should be completely removed, and the soil sterilised by burning or by the use of gas-lime. Unless this is done the fungus will probably extend in the soil to the roots of adjoining cherry or plum trees. It would be wise to replace dead or removed trees by apple or pear trees, which are not attacked by this disease.

The Frit Fly.

The larvæ of the *Oscinids* or *Chloropidæ*—a group of tiny two-winged flies—are known to be very injurious to cereals and pasture grasses in Europe and America. The species *Oscinis frit* is one of the chief cereal pests in Europe, and there are continental records of *Oscinid* attacks on oats, barley, wheat, rye, maize, and various grasses. The chief damage in Britain is to oats, although barley may also suffer. The larvæ or maggots of the fly do the harm by feeding in the heart of the young plants or in the grain in the young ears, according to the time of the year and the different broods of the insect.

Every year in England the Frit Fly is the cause of some loss, but there are years that may be spoken of as "frit fly years," when the infestation and consequent loss is excessive. This year, during June, complaints have been numerous. One correspondent, sending a sample, writes of his oats rotting and withering away. Another writes of taking out "handfulls of infested plants." Still another writes, "I have a field of oats this season quite useless as a crop. The oat plants have continuously weakened and many have died during the past five or six weeks." A typical communication from Oxfordshire tells how "some oats planted in April

are quite spoiled ; the land is very clean and in good heart ; it is about five years since the maggot first appeared on my farm and then quite destroyed a piece of nine acres ; it is good medium land and up till the last few years has been noted for its good oats." In the various samples sent either maggots or puparia of the Frit Fly were found.

Symptoms and Result of infestation.—(1) Pale spots may show on the upper parts of leaves still green, the result of the gnawing of the tissue by the larva before it proceeded downwards and inwards ; (2) a browning or reddening of the leaves ; and (3) a stunted growth and failure of the plants. The plant may not be hopelessly destroyed as there may be a tendency to tiller ; the new shoots, however, are often twisted and swollen and simulate the appearance of eel-worm infestation. I found this to be quite marked in some of the material examined.

Where the grains are attacked they are hollow, shrunken and shrivelled.

DESCRIPTION AND LIFE HISTORY OF INSECT.

Fly.—The adult fly measures less than $\frac{1}{8}$ in. in length, the body is bright shining black, and the legs are also black, save the feet which are yellow or brown-yellow. The wings are delicate and transparent, with the fore-edge brown. In the fields, the fly has a characteristic skipping movement.

Larva.—The maggot measures $\frac{1}{8}$ in. in length and is round, fleshy, and legless. At the front end are two curved mouth-hooks, and at the blunter hind end, on examination with a lens, there may be seen two projecting spiracles. Under a good magnification branched respiratory processes will be found at each side of the head.

Puparium.—The maggot pupates under cover of its last moulted skin ; the resulting puparium or pupa-case is round and red-brown with the spiracular processes at the hind end well marked.

Life History—Typically three generations are possible in the year. The flies of the first generation issue in April and the beginning of May, and proceed to lay their eggs on the young oat plants. The eggs are laid on the leaves. The maggots on hatching pass to the lower part of the plant, behind the leaf sheaths and right into the heart of the plant. The full grown

maggot pupates in the plant, and by the month of July the next generation or brood of flies begins to come away. From my own specimens I have bred out the flies by the 5th July, but this season, at least in the open, the brood has probably been a little later. If, from any cause whatever, the oat still produces new young shoots the flies may lay on these, but the flies of this July brood lay their eggs characteristically on pasture and wild grasses or, if the stage of the plant suit, in the ears of oat (and barley) where the grains are young. The maggots of this brood then are harmful both to vegetative parts and to grain. Infestation in the ears may not show itself externally, the grains being under cover of the glumes, but the result appears at the harvest in the shape of light samples and of gnawed shrivelled grains. This attack on the ears is more characteristic and severe in the northern counties than in the south, as the age and condition of the ear render it suitable for the egg-laying of the brood that developed itself in young oat plants.

By August and September the third brood of flies is ready. The flies of this brood may on occasion be found in swarms in places where infected grain has been stored, or in neighbouring places. The flies of this third brood lay their eggs on such grasses as are in suitable condition. The maggots feed and pupate in due course, and from the puparia the flies, whose egg-laying in the young oat begin the cycle for the year, issue in the following April and May.

Treatment.—1. The foregoing life history will have made clear the importance of a correct sowing period. The oats should be put in as early as possible so that the plants may have made some progress before the issue of the April and May brood of flies. The flies choose for their egg-laying young tender parts, hence grown plants are made use of less willingly, and even if they are infested, they suffer less.

The wisdom of early sowing in dealing with the Frit Fly has received repeated confirmation. Miss Ormerod quotes two cases :—" All early spring fields seem to have escaped, while in some others, sown late, 90 per cent. of the crop is gone." Again, " One field of oats sown on 29th March enjoyed almost complete immunity; in another field sown on 29th April over 70 per cent. of the first stems were destroyed."

One of the correspondents of the Board of Agriculture and Fisheries writes, "Oats sown in March are not attacked, those sown in April on land in first rate order came up well but a great quantity are attacked."

2. Where attack is feared, or noticed early, a stimulating dressing should be applied.

3. Badly infested plants cannot be saved and should be ploughed in deeply.

4. Flies found swarming in granaries, stores, &c., from harvested corn should be destroyed.

5. If a crop was known to be infested in the autumn and winter, the planting of oats should be avoided as far as possible in the next season near such an area.

6. Should wild grasses be known to be affected these should be destroyed in the winter. It is conceivable that in certain circumstances advantage might be taken of the fondness of the fly for oat by growing some as trap or catch plants in September. These trap plants should be removed and burnt, with the enclosed brood.

R. STEWART MACDOUGALL.

Gooseberry Mildew Orders.

The Board of Agriculture and Fisheries by virtue of the powers vested in them under the Destructive Insects and Pests Acts, 1877 and 1907, have issued two orders with a view to the prevention of gooseberry mildew, viz., the Gloucestershire and Worcestershire (Gooseberry Mildew) Order of 1907, dated 12th July, 1907, and the Isle of Ely, Lincolnshire (parts of Holland) and Norfolk (Gooseberry Mildew) Order of 1907, dated 22nd July.

These orders require the occupier of any premises on which there is a bush which is diseased or suspected of being diseased forthwith to notify the fact to the Local Authority, and where practicable a specimen showing the disease is to accompany the notice.

Failure to give notice renders an occupier liable on conviction to a penalty not exceeding ten pounds.

The Local Authority on receiving notice of the existence or supposed existence of disease is to take such steps as may be necessary to determine whether the disease exists, and the area covered by diseased bushes, or by bushes to which the disease is likely to spread, and to cause a notice to be served on the occupier of any land within that area requiring him to adopt measures for prevention of the spread of the disease.

These measures are :—

(i) The immediate destruction by burning or other effective method of all diseased bushes, including the fruit on such bushes ;

(ii) The thorough spraying as soon as possible with a solution of copper sulphate (containing at least 1 lb. of copper sulphate to a gallon of water) or with some other approved fungicide of the site of any bush that has been destroyed ;

(iii) The thorough spraying of all gooseberry and currant bushes on the area defined in the notice with an approved fungicide. The spraying is to be carried out at such time as an inspector of the Local Authority shall direct and to his satisfaction.

No gooseberry or currant bush or any part of any such bush is to be removed out of the area defined in the notice except with a licence authorising such removal, but this restriction is not to apply to fruit of a bush that is not diseased.

Failure to adopt any measure required for prevention of the spread of the disease renders the occupier liable on conviction to a penalty not exceeding ten pounds.

Powers of Entry.—Any inspector or other officer appointed in that behalf by the Local Authority, and any inspector of the Board, may enter any land on which he has reason to believe that disease exists or has recently existed and examine any gooseberry or currant bush on such land.

The Gloucestershire and Worcestershire Order came into force on 22nd July, and the Isle of Ely, Lincolnshire (parts of Holland) and Norfolk Order on 1st August, 1907.

Import of Live Stock into Russia.

His Majesty's Consul General at Odessa (Mr. C. S. Smith) in his report to the Foreign Office (Annual Series, No. 3653) for 1906, observes that in South Russia cattle are largely used for draught purposes, dairy farming being mostly confined to the Northern provinces. English cattle, chiefly shorthorns, have hitherto been imported on a considerable scale to improve the breed. During 1906, however, various causes contributed to check this import, among which were the unsettled state of the country and the demand for long credit.

The recently increased demand for British shorthorn breeding stock in Chile and the Argentine, and the readiness shown by farmers in those countries to pay prices far beyond the present means of many Russian importers have also tended to stop the import of British-bred shorthorns into Russia. Indeed. the prices for British-bred shorthorns have doubled during the past eighteen months. A quantity of German-bred shorthorns of British extraction are, however, imported. German farmers import British shorthorns into Germany, breed them, and send the resulting stock into Russia at far cheaper prices than those asked by British breeders.

It is stated that the cost of transporting a bull in the United Kingdom from the stock farm to the coast is frequently as great as that of sending the same bull from Riga (to which most British cattle are shipped) to Odessa—a journey of twelve to eighteen days. This considerably impedes the import of British cattle.

British bulls, though highly suitable for breeding, often cannot stand the rough pasturage and treatment which they find in Russia. At the same time the half breeds are in every way a great improvement on native stock.

Attempts to persuade farmers to improve their stock are made from time to time by the Russian Government, which two years ago bought sixty British bulls, imported them into Rostov, and sold them at half-price to local farmers with a view to encouraging further purchase. But the example has not been much followed.

It seems that a more settled condition is needed for the further development of the import trade in British cattle;

while, for the present, prices in the United Kingdom are too high and conditions in Russia too depressed.

British rams are imported, many through Riga, for cross-breeding with local species. The varieties most in vogue are Southdown, Hampshire, and Shropshire. Lincolnshire sheep cross well with the Bessarabian Zegai sheep, which is reputed for a coarse, strong, long Lincoln class of wool. Sheep breeding, however, is rapidly becoming of less importance in the Caucasus and South Russia, large numbers of the herds being transferred to Siberia.

Possible Demand for Pedigree Stock in Brazil.

The Board have received from the British Consul-General at Rio de Janeiro through the Foreign Office a translation of new Regulations made by the Brazilian Government for facilitating and encouraging the importation of breeding stock. These regulations provide that the Federal Government shall grant aid to agriculturists for the purchase of approved animals for breeding purposes. Expenses incurred in transporting animals from their country of origin to their final destination may be refunded. No aid will be given in connection with animals coming from countries where epizootic diseases are prevalent.

In view of the possible demand which may arise for pedigree stock in Brazil in consequence of this action, British breeders would be well advised to advertise in some Brazilian newspaper, or to take other means of bringing their stock before cattle-breeders in Brazil. The British Consul-General (Mr. Arthur Chapman) will be happy to give information to intending importers.

Improvement of Cattle Breeding in Switzerland.

With a view to improving the breeds of cattle in Switzerland the Swiss Government have, since 1893, voted the sum of £16,000 annually (increased in 1902 to £20,000) to be used to supplement the efforts of the different Cantons to encourage the breeding industry.

The money is awarded in the form of premiums for bulls, cows and small herds, and in small grants to encourage the

formation of breeding and herdbook societies. The premiums supplement and are equal in amount to the premiums awarded by the Canton; they are awarded on the result of the judging at local competitions held for the purpose, and in order to put farmers to as little expense as possible these are somewhat numerous, 29 being held in the Canton of Berne, 43 in Fribourg and 31 autumn competitions and 34 spring competitions in Vaud. The judges are a permanent body and travel from one place to another. These competitions or shows are on the simplest scale, lasting for one day only and being confined merely to the judging of the animals exhibited. The premiums, however, are not actually awarded for nine months after the competition in order that satisfactory evidence may be produced of the use of the animals for breeding purposes. The judging is based on a system of points according to a fixed scale. The animals are then divided into classes according to the number of points received, and all those in the same class receive the same premium. This method is found to work satisfactorily, as notwithstanding the number of small shows approximately the same class of animals receive similar premiums at all of them.

The premiums awarded differ in each Canton, according to the sum of money available. In Fribourg bulls over 15 months received £12, £8 and £4 each in the first, second and third classes. In Vaud the highest premium was £16. Premiums are also given for sheep and goats.

Canadian Fruit Marks Act.

The Canadian Fruit Marks Act of 1901, which was amended in 1906, provides for the marking or branding of all closed boxes or barrels of fruit with a designation of the grade of fruit and its variety, together with the full name and address of the packer. There are four grades, viz.: Fancy, No. 1, No. 2 and No. 3. "Fancy" quality is to consist of well grown specimens of one variety, of uniform and of at least normal size and of good colour for the variety, of normal shape, free from worm holes, bruises, scab and other defects and properly packed. No. 1 quality is to consist of well grown specimens of one variety, sound, of not less than medium size and of good colour for the variety, of normal shape and not less than 90 per cent. free from scab, worm holes,

bruises and other defects, and properly packed. No. 2 quality is to consist of specimens of not less than nearly medium size for the variety, and not less than 80 per cent. free from worm holes and such other defects as cause material waste, and properly packed. Whenever any fruit in a package is found to be so packed that the faced or shown surface gives a false representation of the contents of the package, it will be marked with the words "falsely packed," or in the case of false marking with the words "falsely marked." The definition of grades do not vary from year to year; no provision is made for lowering the standard when the quality of the crop is poor. In such a case the only result would be that a smaller proportion of the fruit is of the higher grades. The Act makes no restriction as to the quality of fruit marked No. 3.

Production of Sulphate of Ammonia.

Chemical manure works are subject to inspection under the Alkali, &c., Works Regulations Acts, and from the report of the Chief Inspector for 1906 (H.C. 161), it appears that there were 167 chemical manure works and 495 sulphate and muriate of ammonia works under inspection last year. The number of works engaged in the manufacture of chemical manure, principally from imported mineral phosphate, remains fairly steady from year to year. The Chief Inspector states that in some districts manufacturers have found difficulty in covering their requirements of mineral phosphate for the current season, though it is hoped that by 1908 difficulties of this sort will be lessened, as the newer sources of supply are then expected to be able to meet the demands made upon them. The imports of materials used in this trade during the past three years have been as follows :—

—	1906.	1905.	1904.
	Tons.	Tons.	Tons.
Guano	24,906	29,223	24,276
Mineral phosphates	442,970	421,026	419,221
Nitrate of soda	108,486	104,436	120,526

A not inconsiderable proportion of the nitrate of soda imported was used in processes connected with the manufacture of sulphuric and nitric acids.

There were 495 works or separate processes for the manufacture of sulphate or muriate of ammonia, an increase of 46 since 1904. The most important source from which compounds of ammonia are obtained commercially is coal. When this is treated for the production of coal-gas or for the manufacture of coke used in iron smelting, an "ammoniacal liquor" results, which forms the raw material for the manufacture of ammonium salts. The distillation of the bituminous shales used in the Scotch paraffin industry also yields a certain amount, and the ammonia produced in iron works, where coal is used instead of coke, is also collected. The quantity of sulphate of ammonia produced in the United Kingdom is shown in the following table :—

—	1906.	1905.	1904.
	Tons.	Tons.	Tons.
Gas works	157,160	155,957	150,208
Iron works	21,284	20,376	19,568
Shale works	48,534	46,344	42,486
Coke-oven works	43,677	30,732	20,848
Producer-gas and carbonising works (bone and coal)	18,736	15,705	12,880
Total	289,391	269,114	245,990

A considerable proportion of the increase of 20,000 tons was contributed by the coke oven works, which have nearly trebled their production since 1902, when the yield was only 15,300 tons.

The exports of this product amounted to 201,500 tons, compared with 189,500 tons in 1905, to that the balance available for home consumption was about 88,000 tons.

Report on Crop Prospects.

The Crop Estimators of the Board of Agriculture and Fisheries reporting on the condition and prospects of the principal crops on 15th July unanimously comment on the adverse influence of the wet and cold weather which prevailed during the spring and early summer, and remark that the recent advent of fine warm weather has materially improved the outlook. The continuance of more favourable conditions generally since the reports were made must be further taken into account.

Wheat is reported as generally promising an under average

crop in every division of Great Britain, except in the west midland and south-west counties and in Wales, where it appears to be about an average. Barley is below average in all divisions. The best of the cereal crops at the time of reporting is oats, which are given as above average in all but the northern and north-western divisions of England, and in the west of Scotland.

Potatoes are under average, while roots promise to be an average crop.

In every division of England and in Wales there has been an abundant yield of hay, well exceeding the average, but the quality is reported as indifferent owing to excessive wet and to the bad conditions under which much of the crop has been secured. In Scotland, however, the yield appears to be somewhat below average.

As regards fruit, the crop of apples is generally short and in some districts quite a failure, owing to sharp frosts in the late spring. Plums promise a plentiful crop, but strawberries, though generally abundant, have been retarded by the absence of sun.

Hops are generally backward, but are not so badly affected with vermin as last year.

Labour is generally plentiful, but in some districts owing to local circumstances the supply is rather scarce.

Summarising the reports, and representing an average crop by 100, the appearance of the crops in mid-July indicates yields for Great Britain as a whole which may be represented by the following percentages:—Wheat, 99; barley, 98; oats, 100; potatoes, 97; roots, 100; hay, 106.

The condition of fruit and hops is summarised from the reports of the Crop Estimators of the Board on July 15th as follows:—

Report on Fruit and Hops.

England, East.—The reports indicate that apples and pears will be a short crop and plums over average, while strawberries are under average, and bush fruit average.

England, North-East.—Fruit is not largely grown. Apples will be a short crop, pears an average, and plums plentiful. Strawberries are generally below the average.

England, South-East.—Apples are reported to be a short crop and badly blighted in some districts. Pears are an average crop and plums are plentiful. There has been an abundant crop of strawberries in Hants and Kent, which, however, have needed more sun. Cherries are a small crop and have been injured by the wet and cold, and bush fruit is about an average.

England, East Midland.—The crop of apples is poor, while pears are only fair. Plums, however, are very plentiful, and there is an average crop of bush fruit.

England, West Midland.—In Hereford and Worcester the crop of apples is reported to be very bad, one estimator in the former county stating that they are an entire failure. Pears are under average, but plums and damsons are very plentiful, and there is an average crop of small fruit.

England, South-West.—Little fruit is grown for market, but in Somerset and Devon, where apples are grown for cider-making, the crop is reported to be very bad.

England, North.—Fruit crops, where mentioned, are reported to be under average.

England, North-West.—Apples and pears appear to have done badly, and stone fruit is only a moderate crop.

Wales.—Fruit crops are much below average, except in Radnor, where apples, plums, and gooseberries are said to be plentiful.

Scotland, East.—In Aberdeen there is a promise of an average crop of strawberries, and in Perth, a good crop of apples and pears is reported, an excellent crop of plums, gooseberries, and currants, a good crop of strawberries, and fair of raspberries.

Scotland, West.—In Lanark all fruit crops are reported late, and under average on account of the cold weather and absence of sunshine.

Hops.—In *Kent* hops are rather backward and are generally short in the bine, requiring warmer nights. In some districts there is a good deal of vermin, which has necessitated washing, though it is not nearly so prevalent as it was last year. In *Hants* the crop is reported to be looking fairly well. In *Sussex* the hops look promising, but have been retarded by the cold. In *Surrey* the crop is short in the bine and needs warmer weather. In *Salop* the crop is improving. In *Worcester* hops are very backward, the bine not having yet reached the top of the poles, but the crop is generally healthy. In *Hereford* hops are up to the present a good colour and have not been affected to any serious extent by aphis or blight. The crop is very backward, being fully three weeks behind in its growth.

Notes on the Weather and the Crops in July.

The unfavourable weather which characterised June was continued through the commencement of July. In the *first* week the warmth was "very deficient" in every station of the British Isles, with "scanty" or "moderate" sunshine. The rainfall was "heavy" in the Midland Counties in England S. and S.W. and in Ireland.

The *second* week was almost a repetition of the first. Warmth was "very deficient" in every station in the British Isles. Sunshine was "scanty" in England N.E., E. and in the Midlands. In Scotland E. it was "very scanty." Rainfall was normal. Frosts were recorded in more than one place.

In the *third* week a welcome change was recorded. In the Western Section sunshine was "very abundant," and the warmth "very unusual," except in England S.W., where it was only "unusual." In the Eastern Section sunshine was "abundant," except in England N.E. and E., where it was only "moderate." Rainfall everywhere was "very light" (Ireland S. "light") or "nought." It is remarkable that England N.E., which, between December 2, 1906, and March 2, 1907, enjoyed ten weeks of "abundant" sunshine out of a possible thirteen, has not been blessed with one such week out of the possible seven since the 2nd June.

During the *fourth* week the weather was of a changeable nature. Warmth as a rule was "deficient," and sunshine nearly everywhere "scanty." Rainfall was "very much below the average in the northern half of the United Kingdom." In England S.W. there was a slight excess. In England N.E. it was "very light," in England E. "moderate," and in the Midlands "very heavy." Over 2½ inches of rain fell in Bath in three hours, and in other places, especially Wales, there were thunderstorms with very heavy rainfall and hail.

The change which took place in the weather after the 10th July is remarkably well illustrated by the Board's experience in connection with the notice issued at the end of June calling attention to the desirability of making ensilage. Up to that day hundreds of letters were received daily asking for copies of the leaflet on that subject, but on that day the weather improved and became less rainy and cold, and the requests for the leaflet fell away to a very small number. Letters from all parts described the hay as being damaged. In Berkshire the wheat was said to be of a bad colour, and harvesting not likely to begin before the second week of August. Reports from Kent make similar statements, but otherwise the crops were good, with little damage from insect pests. A correspondent from North Lancashire describes the crops as backward, but comments on the general absence of fly in the turnips and the length of the straw in the corn crops. The Board have received several notices of the appearance of potato disease, but exceedingly little has been said about the "fly." Several sensational accounts of damage done by the thunderstorm and the hail in South Wales appeared in the daily papers. The Board are informed that the thunderstorms and hail affected the mining valleys—where there is little or no arable land. A correspondent wrote that at the Swansea end of Glamorgan no damage was done at all. There was a sharp hail and thunderstorm on the 22nd July, though not of long duration. No damage was done, and even a "strawy crop of oats," which it was expected would be laid, was untouched. In South Lancashire there was a thunderstorm of exceptional severity on the evening of the 21st, the hail being very large. The storm lasted some hours. Considerable damage was done to the crops, and some of the effects are undergoing investigation. The Board would be glad to receive reports on the effect of the weather on harvesting operations during the month of August, with dates of the commencement of cutting of each crop.

Notes on Crop Prospects Abroad.

France.—According to an official report published in the *Journal Officiel*, 18th July, the condition of potatoes on 1,917,000 acres was reported to be "good," on 1,680,000 acres "fairly good," and "passable" on 91,000 acres.

Germany.—The official report on the crops in the middle of July shows in several cases a somewhat improved condition compared with the previous month notwithstanding unfavourable weather. The numerical standard is as follows:—Winter wheat, 2·8; spring wheat, 2·4; winter rye, 2·4; spring rye, 2·3; barley, 2·2; oats, 2·3; and potatoes, 2·4 (1 = very good, 2 = good, 3 = average or medium, 4 = small, and 5 = very small). Both the winter cereals are thin and over-run with weeds, and the harvest is likely to be generally a fortnight later than usual. Spring crops seem relatively satisfactory, and the condition of potatoes is also generally described as favourable.

Hungary.—The official report of the Minister of Agriculture, up to the 15th July, shows that the weather conditions generally have been unfavourable to the crops, and the estimates of the yields are lower than those quoted last month.

Roumania.—The Roumanian Ministry of Agriculture estimates that the wheat crop will yield 5,500,000 qrs., as against a crop of 13,900,000 qrs. last year, and an average of 8,940,000 qrs. during the past five years.

Bulgaria.—The official estimate of the Bulgarian wheat crop (*Beerbohm*, 19th July) indicates that the yield will be 45 per cent. below a full average.

Austria.—The report of the Austrian Ministry of Agriculture regarding the condition of the crops in the middle of July (quoted by *Dornbusch*, 18th July), states that the weather influences since the last report issued have been generally favourable, and the outlook now is for at least a good average crop. The progress of earing and ripening promises a good average yield for winter wheat and rye. Spring wheat, rye and barley are everywhere in good condition.

Spain.—A semi-official estimate of the wheat crop indicates a yield of 14,000,000 qrs. or about 5,000,000 qrs. below that of last year (*Beerbohm*, 26th July).

United States.—The Crop Reporting Board of the Bureau of Statistics of the Department of Agriculture in its report on crop conditions on 1st July, states that preliminary returns show the acreage under maize to be about 98,099,000 acres, an increase of 1,361,000 acres as compared with the final estimate last year. The average condition of the growing crop was 82·8 on 1st August as against 88·1 in 1906. Preliminary returns indicate a winter wheat crop of 409,500,000 bushels, or an average of 14·6 bushels per acre as compared with 16·7 bushels last year. The average condition of spring wheat on 1st August was 79·4 as against 86·9 in 1906.

World's Wheat Crop.—According to an estimate which appeared in *Beerbohm's Corn Trade List* (26th July), the wheat crop of the world for 1907, is put at 388,750,000 qrs. (of 480 lb.) as against 443,080,000 qrs. in 1906, 422,645,000 qrs. in 1905, 401,860,000 qrs. in 1904, 411,545,000 qrs. in 1903, and 399,400,000 qrs. in 1902. "It is not, of course, possible to judge the world's crops yet with any degree of certainty, but when we read the most reliable reports from the various countries, it is impossible to resist the conclusion that a serious deficiency in the world's wheat production, compared with last year, and, indeed, compared with the average is inevitable."

Miscellaneous Notes.

Opening for Fertilisers in Russia.—H.M. Consul-General at Odessa observes, in his report to the Foreign Office (Annual Series, No. 3653), that efficient advertising could open a vast market for British fertilisers containing nitrogen. The present import is small in the south, but growing in the north; prices are high and advertising consequently the more necessary to place the import. The nitrates find their way principally to Poland, to the Kiev Government, &c., for use on the immense area under sugar beet. Much more could be done if sellers would deal on the spot. Favourable results have been obtained by sending agricultural chemists under whose directions parallel plots were cultivated with and without phosphates, potash salts, &c. These demonstrations should be more widely practised.

The best South Russian field for nitrates would be among the fruit gardens and vineyards of the Crimea and Caucasus, where the highly intensive cultivation and the rocky or shingly nature of the soil demand the use of fertilisers. But through the whole district intensive cultivation is growing every year, and with it the need of fertilisers.

National Dairy Show at Chicago.—The second National Dairy Show is to be held at Chicago from 10th to 19th October, 1907; all branches of the dairying industry will be represented, and numerous meetings of an educational character are being arranged.

Leaflet on the Pith Moth.—The Board's Leaflet (No. 90) on the pith moth is under revision. Later observations on this insect have shown that there has been confusion between two closely allied moths, *Laverna atra* and *Blastodacna vinolentella*, and it is the latter of the two insects which is described in the revised leaflet as being the true pith moth, the caterpillars of which causes much damage to young apple and possibly other fruit trees. The caterpillars of *L. atra* are found in autumn not in apple shoots but in the fruits of the hawthorn.

Directory of Industrial Associations.—The Directory of Industrial Associations for 1907 (Cd. 3554, price 11*d.*), has been issued by the Board of Trade, and contains the names and addresses of secretaries of all associations of employers or workpeople concerned with questions affecting labour so far as known to the Department. The names and addresses are also given of 2,646 workmen's co-operative societies, including co-operative agricultural societies, egg and poultry societies, co-operative dairies, agricultural insurance societies, and co-operative credit banks.

Dairies, Cowsheds and Milkshops (Regulations).—A Return (H.C. 152) has been presented to Parliament by the Local Government Board, showing (*a*) the names of the Councils of Boroughs and Urban and Rural Districts who have made Regulations

under the Dairies, Cowsheds and Milkshops Order of 1885; and (*b*) the number of Councils of each class who have not made any such regulations. Out of some 1,800 urban and rural districts, Regulations are in force in all except 36 Borough Councils, 126 Urban District Councils and 165 Rural District Councils.

Specimens of Gall-Midges.—Few families of flies (*Diptera*) possess greater interest than the Gall-Midges (*Cecidomyidæ*), and apart from its scientific interest, this family is one of great economic importance as is evidenced by the presence of such forms as the Pear Midge, the Hessian Fly, the Pea Midge, the Wheat Midge, the Willow Gall-Midge, and many others injurious to different crops. At the meeting of the Association of Economic Biologists, held at the Imperial Institute, London, on July 4th, Mr. Walter E. Collinge (of the Department of Economic Zoology, University of Birmingham) read a paper on the subject, and the Board are informed that it would greatly assist Mr. Collinge in his further investigations into the life histories, structure, &c., of these insects, if entomologists, horticulturists, farmers, and others meeting with specimens of the insects and their galls would send them to Mr. Collinge at the University of Birmingham.

Abnormal Raspberry Canes.—Some specimens of raspberry canes, which presented an abnormal appearance, were received by the Board at the end of June. The abnormality was found to be due to an over-development of periderm, caused by an excess of moisture at the roots.

Destruction of Nettles.—Where nettles prove troublesome around buildings, in pastures, &c., they should be forked out, so removing the creeping underground stems. This should preferably be done in spring, when a liberal dressing of salt should be applied to the infested spots.

Knapweed.—The weed known as Knapweed (*Centaurea nigra*, Linn.) is sometimes troublesome, and spreads in impoverished soils, especially if allowed to seed. If practicable, seeding should be prevented by early cutting, and the soil should be manured. The manures to be employed will naturally vary, according to the locality, but in general the following mixture is likely to be beneficial :—$\frac{3}{4}$ cwt. sulphate of ammonia; 3 to 4 cwts. superphosphate; 2 to 3 cwts. kainit per acre. This should be applied every year, until the grasses become improved and vigorous, when the Knapweed will be choked out. If farmyard manure is available, a dressing might be given in the second season instead of the artificial manures named.

Importation of Plants into Turkey.—The regulations of the Turkish Ministry of Agriculture prohibit the introduction of plants into Turkey, but the Foreign Office have been informed that, in view of the non-existence in England of Phylloxera, the Ministry of Agriculture will be prepared to make an exception in cases where a certificate of British origin, granted by a British local authority, and legalised by a Turkish Consul, is produced, containing a statement to the effect that no vines exist in the neighbourhood of the district from which the plants come. The Ministry in such cases, on receiving due notice from His Majesty's Embassy, would insruct its Inspector to grant a *visa* sanctioning the entry of the plants in question. A certificate declaring them free from Phylloxera would not be considered sufficient.

Method of Selling Barley in the East of England.—The practice of selling barley by weight or by weighed measure (quarter of 448 lb.) appears to have entirely supplanted the older method of selling by the Imperial measure at several corn markets where inquiries have been made. At Bishop's Stortford, Chelmsford, Darlington, Norwich and Cambridge, practically the whole of the barley sold in 1891 was, according to a return furnished to the Select Committee on Corn Sales, 1893, sold by Imperial measure, whereas the weighed measure of 448 lb. to the quarter is now universal. At several of these markets the latter measure has been customary for some years, but at Norwich it was not until 1905 that the Imperial measure was finally abandoned. At Chelmsford the change is said to date from October, 1903. At York, Berwick and Lincoln the weighed measure seems to have been in use in 1891.

SELECTED CONTENTS OF CURRENT PERIODICALS.

Transactions of the Royal Society of Edinburgh.
Vol. xli., Part 3.—The Plant Remains in the Scottish Peat Mosses. Part 1. The Scottish Southern Upland. Vol. xlv., Part 2.—Part 2. The Scottish Highlands, *Francis L. Lewis.*

Journal of the Land Agents' Society. June, 1907.
Report of the Honorary Consulting Zoologist, *Walter E. Collinge.*

Journal of the Royal Horticultural Society. June, 1907.
The Formation and Care of Lawns and Golf-Greens, *Martin H. F. Sutton;* Parasitic and Saprophytic Plants, *Rev. Professor G. Henslow;* Meteorology in its Relation to Horticulture, *R. H. Curtis;* The Education of the Cottage and Market Gardener, *T. S. Dymond;* The Value of Fruit as Food, *Dr. Josiah Oldfield;* Horticultural Education, *F. J. Baker.*

Journal of the Department of Agriculture, Ireland. July, 1907.
Winter and Summer Dairy Farming, *Prof. James Wilson;* Duck-keeping as a Farm Industry, *H. de Courcy;* The Construction of Piggeries; The Cost of Forest Planting; The Cultivation of Osiers; Cider Making.

Fühling's Landwirtschaftliche Zeitung. 15th July, 1907.
Die Anwendung der Elektrizität in der Pflanzenkultur, *Dr. F. Houcamp.*

Journal für Landwirtschaft. Band 55. Heft 3.
Untersuchungen über den morphologischen Einfluss der Düngung auf die Kartoffel, *Dr. P. Vageler;* Untersuchungen über den Einfluss von Wärme und Sonnenschein auf die Entwickelung des Hafers bei verschiedener Bodenfeuchtigkeit, *Prof. Dr. v. Seelhorst* und *Dr. J. Bünger;* Versuche mit Sommerweizen, *Prof. Dr. v. Seelhorst* und *Dr. J. Bünger.*

Naturwissenschaftliche Zeitschrift für Land- und Forstwirtschaft. July, 1907.
Die Varietäten oder Rassen der Mistel; Infektions versuche mit *Loranthus europaeus;* Beitrag zur Biologie der Mistelkeimlinge; Das Parasitieren der *Loranthaceen* auf der eigenen Art oder anderen *Loranthaceen;* Reproduktion der Mistel, *C. von Tubeuf;* Beiträge zur Kenntnis der Mistel, *Prof. G. Heinricher.*

Agricultural Journal of the Cape of Good Hope. June, 1907.
Dodder and its Eradication, *Dr. Eric A. Nobbs.*

Forestry Quarterly. Vol. v., No. 2.
Some Fundamental Principles of Sylviculture as stated by Prof. Heinrich Mayr. [Translated by *R. Zow* and *A. T. Boisen*].

ADDITIONS TO THE LIBRARY.

Africa—

Cape of Good Hope.—Report of the Surveyor-General, 1906. (38 + xvi pp.) Cape Town: "Cape Times" Ltd., 1907.

Austria—

K. K. Ackerbauministerium.—Die Zusammenlegung der land und forstwirtschaftlichen Grundstücke. (169 pp. + 11 plates.)

France—

Deuxième Congrès international des Jardins Ouvriers, Paris, November, 1906. Compte Rendu. (294 pp.) Paris, 1907.

Lindet, L.—Le Lait, la Crème, le Beurre, les Fromages. (347 pp.) Paris: Gauthiers-Villars, 1907.

Huffel, G.—Economie Forestière. 3e Tome. (510 pp.) Paris: Lucien Laveur, 1907.

Germany—

Lustner, Dr. G.—Die wichtigsten Feinde der Obstbäume. (47 pp.) Stuttgart, E. Ulmer, 1907. 1 m.

Strakosch, S.—Das Problem der ungleichen Arbeitsleistung unserer Kulturpflanzen. (110 pp.) Berlin: Paul Parey, 1907.

Great Britain—

Cowan, T. W.—The Honey Bee. 2nd Edition. (220 pp.) London: Houlston & Sons, 1904.

Royal Horticultural Society.—Journal, Vol. XXXII. (352 + ccxl pp.) London: Spottiswoode & Co., 1907. Price (to non-Fellows) 15s.

Shepperson, Wm.—Field to Dairy. (65 pp.) London: Simpkin Marshall, 1907. 2s. net.

De Vries, Hugo.—Plant Breeding. (360 pp.) London: Kegan, Paul.

Royal Commission on Tuberculosis (Human & Animal).—2nd Interim Report. Part II, Appendix. Vol. I. The Pathogenic Effects of Bovine Viruses. [Cd. 3584.] London: Wyman & Sons, 1907. 9s. 3d.

Finn, Frank.—Birds of the Countryside: Handbook of Familiar British Birds. (190 pp. + 12 coloured plates and 118 illustrations.) London: Hutchinson, 1907.

The Yorkshire Council for Agricultural Education and the University of Leeds.—Guide to Experiments at the Manor Farm, Garforth, 1907. (33 pp. + plan.)

Gilbey, Sir Walter.—Farms and Small Holdings. (21 pp.) Vinton & Co., 1907. 6d. net.

Davis, W. J.—The Birds of Kent. (304 pp.) Dartford: J. & W. Davis, 1907.

Gibson, R. J. H.—Lectures on Plant Physiology by Dr. Ludwig Jost (authorised English Translation). (564 pp.) Oxford: Clarendon Press, 1907. 21s. net.

South Eastern Agricultural College, Wye.—Journal, No. 16. (429 pp.) London: Headley Bros., 1907. 6s. (Residents in Kent and Surrey, 3s.)

Paynter, F. G.—How to make Poultry Pay. (95 pp.) London: Cassell, 1907.

Wallace, Robert.—Farm Live Stock of Great Britain. 4th Edition. (758 pp.) Edinburgh: Oliver & Boyd, 1907. 16s. net.

India—

Department of Agriculture in India, Memoirs:—

Entomological Series. Vol. I, No. 3. The Indian Surface Caterpillars of the Genus Agrotis. (253–374 pp. and 1 plate). Vol. I, No. 4. Individual and Seasonal Variations in *Helopeltis theivora*, Waterhouse, with Description of a New Species of *Helopeltis*. (275–338 pp.)

Botanical Series. Vol. II, No. 1. Some Diseases of Cereals Caused by *Sclerospora Graminiicola*. (24 pp. + 5 plates.)

Forest Bulletin No. 10. A Note on the Duki Fig-Tree Borer of Beluchistan. (7 pp. + 2 plates.)

First Report on the Fruit Experiments at Pusa. (40 pp.)

Ireland—

Department of Agriculture and Technical Instruction.—Committee of Enquiry. Report [Cd. 3572]. (155 pp.) Minority Report [Cd. 3575]. (165 pp.) Minutes of Evidence [Cd. 3574]. (983 pp.) London: Wyman & Sons, 1907. 1s. 4d., 1s. 6d., and 8s. 3d. respectively. Annual General Report of the Department, 1905–06. [Cd. 3543] (551 pp.) London: Wyman & Sons, 1907. 2s. 3d.

Japan—

Statistical Report of the Department of Agriculture and Commerce, Japan. (644 pp.) Tokio, 1907.

Norway—

Aarsberetning angaaende de offentlige Foranstaltninger til Landbrugets Fremme, 1906. (659 pp.) Christiania, 1907.

United States—

De Vries, Hugo.—Species and Varieties—Their Origin by Mutation. 2nd Edition. (847 pp.) Chicago: Open Court Publishing Co., 1906.

Coburn, F. D.—Swine Husbandry. New Edition. (311 pp.) 1907. *Fulton, A. W.*—Home Pork Making. (124 pp.) 1906. *Craig, R. A.*—Diseases of Swine.—(191 pp.) 1906. *Shaw, Thos.*—The Study of Breeds in America, Cattle, Sheep and Swine. (368 pp.) 1905; Animal Breeding. (406 pp.) 1906. *Peck, C. L.*—Profitable Dairying. (174 pp.) 1906. *Slyke, L. L. van.*—Modern Methods of Testing Milk and Milk Products. (218 pp.) 1907. New York: Orange Judd Company.

Powell, E. C.—Making Poultry Pay. (324 pp.) 1904. Various Authors.—Profits in Poultry. (352 pp.) 1906. *Stoddard, H. H.*—The New Egg Farm. (332 pp.) 1907. *Fiske, G. B.*—Poultry Feeding and Fattening. (160 pp.) 1906; Poultry Appliances and Handicraft. (120 pp.) 1906. Poultry Architecture. (130 pp.) *Myrick, H.*—Turkeys, and How to Grow Them. (159 pp.) 1907. *Root, L. C.*—Quinby's New Bee-Keeping. New Edition. (271 pp.) 1906. *Rice, W. E., & Cox, W. E.*—Squabs for Profit. (117 pp.) 1906. New York: Orange Judd Company.

Bureau of Plant Industry:—

Bull. 96. Tobacco Breeding. (71 pp. + x plates.)

Bull. 100. Miscellaneous Papers:—Cranberry Spraying Experiments; the Wrapping of Apple Grafts and its Relation to the Crown-Gall Disease; Garlicky Wheat; Methods of Testing the Burning Quality of Cigar Tobacco; the Drug known as Pinkroot; Orchard Grass; the Effect of Copper upon Water Bacteria; Conditions Affecting Legume Inoculation. (83 pp.)

Bull. 102.—Part I. Summary of Recent Investigations of the Value of Cacti as Stock Food. (16 pp.) Part V. The Control of Texas Root-Rot of Cotton. (8 pp.) Washington, 1907.

Bureau of Statistics.—Bull. 50. Hops in Principal Countries. (34 pp.)

University of California.—Bull. 184. Report of the Plant Pathologist, 1905–6. (219–258 pp.) Sacramento, 1907.

Hampton Leaflets.—Agricultural Courses. (13 pp.) Hampton, Va., 1907.

Iowa State College of Agriculture.—

Bull. 86. Investigation of Concentrated Commercial Food Stuffs as sold in Iowa. (52 pp.)

Bull. 87. Condimental Stock Foods and Tonics. (28 pp.) Ames, 1907.

Kansas State Agricultural College.—

Bull. 141. Commercial Seeds of Brome-Grass, and of English and Kentucky Blue-Grasses; Adulterants and Substitutes and their Detection. (74–112 pp.)

Bull. 143. Disposal of Dairy and Farm Sewage, and Water Supply. (125–139 pp.) Manhattan, 1907.

Porto Rico Agricultural Experiment Station.—Report for 1906. (32 pp.) Washington: Government Printing Office, 1907.

Washington State Agricultural College.—

Bull. 50. Preliminary Report on Glanders. (30 pp. + 3 coloured plates). 1902.

Bull. 73. Feeding Wild Plants to Sheep. (64 pp.). 1906. Pullman, Washington.

West Indies—

Imperial Department of Agriculture.—Summary of the Results of the Cultivation of Seedling and Other Canes, and Manurial Experiments. Barbadoes, 1904–6. (133 pp.) A.B.C. of Cotton Planting. (98 pp.) 6d. each. Sugar-Cane Experiments in the Leeward Islands, 1905–6. Part I. Experiments with Varieties of Sugar-Cane. (73 pp.) Barbadoes, 1907. 1s.

[Books may be borrowed from the Board's Library on certain conditions, which may be ascertained on application.]

PRICES OF AGRICULTURAL PRODUCE.

Average Prices of Live Stock in England and Scotland in the Month of July, 1907.

(Compiled from Reports received from the Board's Market Reporters.)

Description.	England. First Quality.	England. Second Quality.	Scotland. First Quality.	Scotland. Second Quality.
Fat Stock :—	per stone.*	per stone.*	per cwt.†	per cwt.†
Cattle :—	*s. d.*	*s. d.*	*s. d.*	*s. d.*
Polled Scots	8 4	8 1	39 9	36 6
Herefords	8 5	7 9	—	—
Shorthorns	8 2	7 6	38 6	35 9
Devons	8 5	7 8	—	—
	per lb.* *d.*	per lb.* *d.*	per lb.* *d.*	per lb.* *d.*
Veal Calves	7¾	7	8¼	6½
Sheep :—				
Downs	9	8¼	—	—
Longwools	8½	7¾	—	—
Cheviots	9½	8¾	9¼	8¼
Blackfaced	8¾	8	9	7¾
Cross-breds	9	8¼	9¼	8½
	per stone.*	per stone.*	per stone.*	per stone.*
Pigs :—	*s. d.*	*s. d.*	*s. d.*	*s. d.*
Bacon Pigs	6 8	6 3	6 4	5 7
Porkers	7 0	6 7	6 8	5 11
Lean Stock :—	per head.	per head.	per head.	per head.
Milking Cows :—	£ *s.*	£ *s.*	£ *s.*	£ *s.*
Shorthorns—In Milk	21 0	17 16	22 5	17 17
,, —Calvers	20 8	17 3	20 0	16 18
Other Breeds—In Milk ..	15 12	13 5	18 13	15 11
,, —Calvers ...	14 15	14 0	18 13	15 12
Calves for Rearing	2 2	1 14	2 17	1 11
Store Cattle :—				
Shorthorns—Yearlings ...	9 17	8 3	9 11	7 16
,, —Two-year-olds ...	13 18	11 18	14 10	12 5
,, —Three-year-olds	16 15	15 7	16 5	13 13
Polled Scots—Two-year-olds	—	—	14 17	12 17
Herefords— ,,	14 5	12 17	—	—
Devons— ,,	14 0	12 0	—	—
Store Sheep :—	*s. d.*	*s. d.*	*s. d.*	*s. d.*
Hoggs, Hoggets, Tegs, and Lambs—				
Downs or Longwools ...	37 10	32 9	—	—
Scotch Cross-breds... ...	—	—	40 0	29 1
Store Pigs ;—				
Under 4 months	28 7	21 3	22 4	18 3

* Estimated carcase weight.
† Live weight.

AVERAGE PRICES of DEAD MEAT at certain MARKETS in ENGLAND and SCOTLAND in the Month of July, 1907.

(Compiled from Reports received from the Board's Market Reporters.)

Description.	Quality.	London.	Birmingham.	Manchester.	Liverpool.	Glasgow.	Edinburgh.
		per cwt. s. d.	per cwt. s. d.	per cwt. s. d.	per cwt. s. d.	per cwt. s. d.	per cwt. s. d.
BEEF :—							
English	1st	54 0	53 6	54 0	—	59 0*	59 6*
	2nd	53 0	48 6	49 6	—	56 0*	51 6*
Cow and Bull ...	1st	—	47 0	44 6	43 6	46 6	45 0
	2nd	—	41 6	38 6	39 0	42 0	36 6
U.S.A. and Canadian :—							
Port Killed ...	1st	55 0	53 0	53 0	53 0	54 0	53 0
	2nd	50 6	48 0	49 6	48 6	51 6	45 6
Argentine Frozen—							
Hind Quarters ...	1st	36 0	36 6	36 0	35 6	38 6	39 0
Fore ,, ...	1st	28 6	29 6	29 0	28 6	30 6	31 0
Argentine Chilled—							
Hind Quarters ...	1st	46 0	45 0	45 0	42 6	42 0	46 6
Fore ,, ...	1st	32 0	32 6	—	31 6	—	31 6
American Chilled—							
Hind Quarters ...	1st	56 6	55 6	55 0	54 0	57 0	57 0
Fore ,, ...	1st	37 0	37 6	36 0	36 0	38 0	39 0
VEAL :—							
British	1st	64 0	63 0	64 0	70 0	—	—
	2nd	57 0	51 6	56 6	63 0	—	—
Foreign	1st	64 0	—	—	—	—	58 6
MUTTON :—							
Scotch	1st	79 6	—	77 0	77 6	78 0	74 0
	2nd	72 6	—	72 6	73 0	66 0	61 0
English	1st	73 6	71 6	73 6	71 6	—	—
	2nd	65 6	56 6	67 0	67 0	—	—
U.S.A. and Canadian—							
Port killed ...	1st	—	—	—	—	—	—
Argentine Frozen ...	1st	31 0	32 6	33 0	32 0	32 6	33 0
Australian ,, ...	1st	30 6	30 6	30 6	29 6	32 6	—
New Zealand ,, ...	1st	43 0	37 6	41 0	41 6	32 6	—
LAMB :—							
British	1st	81 6	78 0	77 0	77 6	84 0	78 6
	2nd	72 6	69 6	69 6	70 0	76 6	72 6
New Zealand ...	1st	51 6	52 0	49 6	49 6	53 0	56 0
Australian	1st	—	45 6	46 6	46 6	44 6	—
Argentine	1st	44 6	46 6	47 6	46 0	44 6	46 6
PORK :—							
British	1st	56 6	60 6	60 0	58 6	56 0	53 6
	2nd	51 6	49 0	55 6	54 0	—	46 6
Foreign	1st	53 6	58 0	57 6	57 6	—	—

* Scotch.

AVERAGE PRICES of **British Corn** per Quarter of 8 Imperial Bushels, computed from the Returns received under the Corn Returns Act, 1882, in each Week in 1905, 1906 and 1907.

Weeks ended (*in* 1907).	Wheat.			Barley.			Oats.		
	1905.	1906.	1907.	1905.	1906.	1907.	1905.	1906.	1907.
	s. d.	*s. d.*	*s. d.*	*s. d.*	*s. d.*	*s. d.*	*s. d.*	*s. d.*	*s. d.*
Jan. 5 ...	30 4	28 4	26 0	24 4	24 6	23 11	16 3	18 2	17 3
,, 12 ...	30 4	28 6	26 1	24 6	24 8	24 2	16 3	18 4	17 4
,, 19 ...	30 5	28 5	26 1	25 0	24 11	24 1	16 5	18 4	17 5
,, 26 ...	30 6	28 7	26 2	25 1	25 1	24 5	16 7	18 7	17 5
Feb. 2 ...	30 6	28 10	26 3	25 0	25 1	24 4	16 7	18 10	17 5
,, 9 ...	30 7	28 10	26 6	25 2	25 3	24 5	16 8	18 10	17 7
,, 16 ...	30 5	28 11	26 7	25 2	25 6	24 1	16 9	19 0	17 7
,, 23 ...	30 10	28 10	26 10	25 0	25 4	24 2	16 10	19 0	17 9
Mar. 2 ...	30 8	28 8	26 9	25 2	25 0	24 2	16 10	19 0	17 9
,, 9 ...	30 9	28 5	26 8	25 2	25 1	23 11	16 10	18 8	17 11
,, 16 ...	30 10	28 5	26 10	24 11	24 8	24 2	16 10	18 10	18 0
,, 23 ...	30 9	28 4	26 10	25 2	24 4	24 0	17 0	18 8	18 1
,, 30 ...	30 9	28 3	26 8	25 1	24 5	23 9	16 11	18 11	18 2
Apl. 6 ...	30 9	28 7	26 9	25 6	24 2	24 3	17 0	18 11	18 3
,, 13 ...	30 8	28 11	26 8	24 3	24 4	23 9	17 6	19 4	18 6
,, 20 ...	30 8	29 4	26 8	24 4	24 0	23 3	17 5	19 1	18 7
,, 27 ...	30 9	29 6	26 10	24 4	24 0	23 3	17 9	19 6	18 9
May 4 ...	30 8	29 10	27 0	25 3	23 10	23 6	18 0	19 9	19 3
,, 11 ...	30 8	30 1	27 6	24 10	24 1	24 0	18 3	20 0	19 7
,, 18 ...	30 10	30 3	28 4	24 8	23 10	23 10	18 5	20 1	20 1
,, 25 ...	30 11	30 4	29 7	24 4	24 2	24 3	18 8	20 2	20 5
June 1 ...	31 3	30 4	31 4	23 6	22 10	24 0	19 1	20 5	20 8
,, 8 ...	31 4	30 3	32 0	24 0	23 4	24 7	18 11	19 11	20 7
,, 15 ...	31 7	30 4	31 10	26 0	23 6	24 7	19 1	20 2	20 11
,, 22 ...	31 7	30 5	31 4	23 9	22 10	24 11	18 10	20 2	20 9
,, 29 ...	31 8	30 3	31 2	23 2	24 3	24 6	19 7	20 1	20 8
July 6 ...	32 1	30 2	31 3	22 11	23 0	24 8	19 6	20 2	20 11
,, 13 ...	32 3	30 5	32 0	23 10	23 8	24 10	19 7	20 4	20 11
,, 20 ...	32 2	30 3	32 6	23 7	23 2	24 6	18 11	20 5	21 1
,, 27 ...	32 3	30 5	32 11	23 11	22 4	27 3	19 3	20 2	20 8
Aug. 3 ...	31 11	30 9	33 2	22 0	22 1	26 4	18 4	19 3	21 2
,, 10 ...	30 5	30 5	33 5	22 5	23 0	26 6	16 11	17 11	21 3
,, 17 ...	28 5	29 0		23 4	24 2		16 4	17 0	
,, 24 ...	27 1	27 9		23 6	25 0		15 9	16 10	
,, 31 ...	26 11	26 9		23 5	24 3		15 9	16 6	
Sept. 7 ...	27 1	26 4		23 4	24 9		15 11	16 3	
,, 14 ...	26 11	25 11		23 7	24 3		16 0	16 1	
,, 21 ...	26 8	25 9		23 10	24 3		15 11	16 0	
,, 28 ...	26 9	25 9		24 3	24 8		16 1	16 2	
Oct. 5 ...	26 9	26 1		24 9	25 0		16 3	16 3	
,, 12 ...	26 11	26 3		24 10	25 3		16 6	16 7	
,, 19 ...	27 1	26 6		25 0	24 10		16 7	16 8	
,, 26 ...	27 4	26 7		24 11	24 10		16 8	16 10	
Nov. 2 ...	27 10	26 7		24 9	24 8		17 1	16 11	
,, 9 ...	28 3	26 6		24 10	24 8		17 4	17 1	
,, 16 ...	28 7	26 4		24 6	24 4		17 8	17 2	
,, 23 ...	28 5	26 3		24 6	24 1		17 9	17 3	
,, 30 ...	28 8	26 1		24 6	24 1		17 11	17 2	
Dec. 7 ...	28 6	26 1		24 7	24 1		17 11	17 4	
,, 14 ...	28 5	26 1		24 5	23 11		17 11	17 3	
,, 21 ...	28 4	26 3		24 6	24 3		17 11	17 3	
,, 28 ...	28 3	26 0		24 7	24 1		18 1	17 3	

AVERAGE PRICES of **Wheat, Barley,** and **Oats** per Imperial Quarter in FRANCE, BELGIUM, and GERMANY, and at PARIS, BERLIN, and BRESLAU.

—		Wheat.		Barley.		Oats.	
		1906.	1907.	1906.	1907.	1906.	1907.
		s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
France:	July ...	40 0	44 0	25 4	26 3	23 5	22 9
	June ..	38 11	42 6	25 5	26 7	23 0	23 0
Paris:	July ...	40 7	46 6	26 7	27 9	24 7	22 6
	June ...	39 3	44 5	26 5	27 8	23 8	23 3
Belgium:	June ...	29 9	33 6	24 2	—	22 4	23 9
	May ...	30 8	31 6	24 5	26 9	22 5	22 2
Germany:	July ...	39 7	46 3	25 5	31 3	24 8	27 11
	June ...	39 2	45 6	25 11	31 10	24 5	27 6
Berlin:	June ...	39 10	44 10	—	—	23 8	27 9
	May ...	40 4	44 6	—	—	23 4	27 7
Breslau:	June ...	36 10	44 4	27 0 (brewing) 24 7 (other)	29 7 (brewing) 27 0 (other)	23 3	25 8
	May ...	35 8	42 4	27 9 (brewing) 25 1 (other)	29 7 (brewing) 26 9 (other)	21 3	25 7

NOTE.—The prices of grain in France have been compiled from the official weekly averages published in the *Journal d'Agriculture Pratique*; the Belgian quotations are the official monthly averages published in the *Moniteur Belge*; the German quotations are taken from the *Deutscher Reichsanzeiger*, the prices for the German Empire representing the average of the prices at a number of markets.

AVERAGE PRICES of **British Wheat, Barley,** and **Oats** at certain Markets during the Month of July, 1906 and 1907.

—	Wheat.		Barley.		Oats.	
	1906.	1907.	1906.	1907.	1906.	1907.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
London...	31 6	33 3	23 5	26 3	—	21 4
Norwich	30 1	31 7	19 1	25 1	19 10	20 7
Peterborough	30 1	32 4	22 3	24 1	19 6	20 6
Lincoln...	28 11	32 4	—	25 10	20 0	20 5
Doncaster	28 4	31 4	—	22 4	19 5	21 0
Salisbury	30 8	32 0	—	24 10	20 9	21 0

AVERAGE PRICES of PROVISIONS, POTATOES, and HAY at certain MARKETS in ENGLAND and SCOTLAND in the Month of July, 1907.

(*Compiled from Reports received from the Board's Market Reporters.*)

Description.	London.		Bristol.		Liverpool.		Glasgow.	
	First Quality.	Second Quality.	First Quality.	Second Quality.	First Quality.	Second Quality.	First Quality.	Second Quality.
	s. d.	*s. d.*	*s. d.*	*s. d.*	*s. d.*	*s. d.*	*s d.*	*s. d.*
BUTTER :—	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.
British ...	12 6	11 0	12 0	11 0	—	—	13 9	—
	per cwt.	per cwt.	per cwt.	per cwt.	per cwt.	per cwt.	per cwt.	per cwt.
Irish Creamery	103 6	101 6	105 0	103 0	100 6	99 0	101 0	98 0
,, Factory	94 0	88 6	94 6	86 0	93 0	85 6	—	—
Danish ...	110 0	108 0	—	—	112 6	107 6	110 0	—
Russian ...	94 0	92 0	94 0	84 0	92 0	84 0	95 6	86 6
Australian ...	96 0	94 0	94 0	86 0	—	—	—	—
New Zealand	100 0	98 0	103 6	99 6	—	—	—	—
CHEESE :—								
British—								
Cheddar ...	86 0	81 0	81 6	72 0	72 0	70 0	60 9	57 6
					120 lb.	120 lb.		
Cheshire ...	—	—	—	—	61 6	56 0	—	—
					per cwt.	per cwt.		
Canadian ...	57 6	56 6	57 0	55 0	56 6	54 6	57 6	56 0
BACON :—								
Irish	69 6	63 0	—	—	68 6	66 6	70 0	67 6
Canadian ...	62 0	60 0	62 6	58 6	61 0	55 6	61 6	57 6
HAMS :—								
Cumberland ...	102 0	94 0	—	—	—	—	—	—
Irish	102 0	93 6	—	—	—	—	97 0	88 6
American (long cut) ...	66 0	64 6	63 0	60 0	62 0	57 6	60 6	58 6
EGGS :—	per 120.	per 120.	per 120.	per 120.	per 120.	per 120.	per 120.	per 120.
British ...	10 5	8 9	9 4	—	—	—	—	—
Irish	9 4	8 4	8 4	7 9	8 6	7 4	8 0	7 6
Danish ...	9 4	8 3	—	—	8 6	7 6	8 6	7 7
POTATOES :—	per ton.	per ton.	per ton.	per ton.	per ton.	per ton.	per ton.	per ton.
Duke of York	116 6	100 0	100 0	90 0	120 0	110 0	—	—
Scottish Triumph ...	—	—	90 0	80 0	140 0	130 0	—	—
Up-to-Date ...	—	—	90 0	75 0	140 0	130 0	—	—
HAY :—								
Clover ...	94 0	83 6	—	—	97 6	75 0	85 0	80 6
Meadow ...	88 6	78 6	—	—	—	—	84 6	80 6

DISEASES OF ANIMALS ACTS, 1894 to 1903.

NUMBER of OUTBREAKS, and of ANIMALS Attacked or Slaughtered.

GREAT BRITAIN.

(From the Returns of the Board of Agriculture and Fisheries.)

Disease.	July.		7 Months Ended July.	
	1907.	1906.	1907.	1906.
Swine-Fever :—				
Outbreaks	216	78	1,559	712
Swine Slaughtered as diseased or exposed to infection ...	985	499	7,230	3,939
Anthrax :—				
Outbreaks	64	38	673	557
Animals attacked	75	63	889	833
Glanders (including Farcy) :—				
Outbreaks	71	93	535	662
Animals attacked	134	195	1,274	1,248
Sheep-Scab :—				
Outbreaks	6	6	406	292

IRELAND.

(From the Returns of the Department of Agriculture and Technical Instruction for Ireland.)

Disease.	July.		7 Months Ended July.	
	1907.	1906.	1907.	1906.
Swine-Fever :—				
Outbreaks	21	12	84	61
Swine Slaughtered as diseased or exposed to infection ...	179	121	1,335	715
Anthrax :—				
Outbreaks	—	—	1	3
Animals attacked	—	—	3	7
Glanders (including Farcy) :—				
Outbreaks	2	1	3	4
Animals attacked	6	1	7	11
Sheep-Scab :—				
Outbreaks	7	4	185	149

(4,000 8 | 07—H & S 1912)

THE JOURNAL

OF THE

BOARD OF AGRICULTURE.

Vol. XIV. No. 6.

SEPTEMBER, 1907.

THE COST OF FOOD IN THE PRODUCTION OF MILK.

JOHN SPEIR.

In Britain very little has been done to show either how much food is necessary to produce a gallon of milk or what is the cost of the same. Other nations have done much more in this respect than we have done, and their farmers have derived great benefit from the information. So much is this the case that there are farms in Denmark and Norway on which the food consumed now produces from 20 to 25 per cent. more butter than it did ten years ago. We have made some headway in showing that particular breeds or families of cows will yield very much more milk than others for a given outlay on food, but as to what quantity is necessary to produce a given weight of milk we have little definite information.

Since the Spring of 1903 the Highland and Agricultural Society of Scotland has been instrumental in forming many milk-record associations, the principal object of which is to weigh, sample, and test for fat the milk of each cow belonging to its members at stated intervals. This is done with the object of finding out which cows give the most milk or butter, so that breeders may use the progeny of those animals alone in replacing cows discharged from the dairy. These associations are generally composed of twelve to eighteen members, each of whom has the milk from his cows weighed and tested. This is done by a young man experienced in such work, who has usually been trained in the Dairy School at Kilmarnock or other suitable centre. He arrives at the

farm during the afternoon and weighs, samples, and tests for fat the milk of the evening. He sleeps at the farm and does the same the following morning, after which he goes on to the next farm. With one exception, the Highland and Agricultural Society has given grants to all the associations formed for this work in Scotland, the exception being in the case of a second association set up in the same parish. The Ayrshire Agricultural Association has also given liberal grants towards this work.

During the winter time, when the cows are in the house, the expert weighs all the food which they receive for the day, and calculates how much of each substance is fed to each animal per day. When the cows are on the pastures, any extra food which they may receive is weighed and recorded. In this way a considerable amount of fairly reliable information regarding the food consumed by the different herds has been collected, and when that is compared with the milk produced, valuable data are obtained regarding the cost of the food necessary to produce the milk of that herd. Every precaution has been adopted which experience suggested as necessary in order to get reliable results, but while the quantities are accurate enough for all practical purposes, nothing like absolute accuracy is claimed for them. At many of the farms the amount of food weighed at one visit corresponded almost exactly with that at the following one. At a few other farms the quantities seemed, however, to be continually varying, and where such was the case extreme accuracy in the results was not to be expected. The quantities used differed considerably even in the same district, and when compared with other districts where the home-grown food also varies, the divergence is greater still.

For those farms where the cows were in milk the whole year, the period embraced in this inquiry was from the beginning of the year till the date at which the cows went to grass. In the cheese-making districts the cows do not usually begin to calve till the end of February or during March, and there a beginning was not usually made till the first week in March, from which time all food was weighed till the cows went to grass, which, according to district, varied from 1st to 15th May.

In the four seasons over which the weighing of the winter

feeding has extended, something like 7,000 cows have been dealt with, so that where little inaccuracies exist, the over-estimates should to some extent be balanced by the under-estimates. In calculating the value of the foods consumed in Ayrshire and Lanarkshire, where all fodder crops are easily sold, each was valued at the following rates :—

	£	s.	d.				
Timothy hay (1st class) ...	3	0	0	per ton, or	3	lb. for a	penny
,, (2nd class) ...	2	6	8	,,	4	,,	,,
Rye-grass and clover hay ...	3	0	0	,,	3	,,	,,
Rye-grass hay seeded ...	2	0	0	,,	4½	,,	,,
Meadow hay	2	0	0	,,	4½	,,	,,
Straw	2	0	0	,,	4½	,,	,,
Turnips	0	10	0	,,	19	,,	,,

Cakes, meals, &c., at cost price.

In Kirkcudbright and Wigtownshire, where there is little or no market for hay or straw, and where turnips are more easily grown than in most of the districts of Ayrshire, the home-grown foods were valued at the following rates :—

	£	s.	d.				
Rye-grass hay	2	6	8	per ton, or	4	lb. for a	penny
Meadow hay	2	0	0	,,	4½	,,	,,
Straw	1	11	0	,,	6	,,	,,
Turnips	0	8	0	,,	24	,,	,,

Cakes and meals at cost price.

According to district, quality, and season, the rates may in some cases be too high and in others too low, and in order to get greater accuracy in future years, it might be desirable to have them fixed for each district by the farmers in the neighbourhood, but in any case it is hoped that they will form a basis sufficiently reliable to permit of comparing one farm with another, especially in the same district. What would probably be the better plan to follow would be for the whole of the south-west of Scotland to adopt a system of food equivalents similar to that which has been in use in Denmark, Sweden, and Norway for about 10 years. Such a system gets rid of the variation in values in different districts, so that there is only the difference in quality to disturb the results. With such a system the feeding of cows in one district can be much more satisfactorily compared with that in another than is possible at present.

Cumnock and District.—Among the members of the Cumnock and District Milk Record Association few turnips are grown, and on only one farm were they used at all, the quantity

given being 18 lb. per cow per day. Excluding turnips, the average ration was 10·4 lb. hay; 5·4 lb. oat straw; 6·7 lb. meals and cakes, and 1·1 lb. of bran or treacle daily. This ration at the prices stated cost on an average 9·71*d.* per day, and on it each cow yielded an average of 27·5 lb. of milk daily. The milk contained an average of 3·47 per cent. of fat, and the cost for food was 3·5*d.* per gallon during the period under review.

A most interesting point in connection with this inquiry is the great variation which exists in the same district in the cost per day for keeping the cows. Where they were kept at greatest expense, viz., 1*s.* 2*d.* per cow per day, the outlay was nearly double that where it was least, viz., 7·81*d.* Where the expense in feeding was greatest the yield of milk was generally high, but often not exceptional, but in nearly every case the cost for food of each gallon of milk was higher than where the outlay was less. A herd of good milking cows judiciously fed will produce milk very much cheaper per gallon than another herd of poorer milkers fed exactly in the same way. This is clearly shown in every district, as although the total food used per day varies considerably, the variation is not nearly so great as the variation in the cost of production of milk per gallon. For instance, in this district in 1907, on the farm on which the feeding was heaviest, each gallon of milk cost 4·97*d.* for food alone, while on another where the cost was lowest, each gallon cost 2·59*d.* for food. Every now and again there are keen discussions in the press over the effect of food on the quality of milk, as the average milk-producer believes he cannot have quality without the excessive use of concentrated foods. Here is an instance, however, where each gallon of milk produced cost almost double that of the other for food, and yet the milk costing most had an average percentage of fat of 3·56 for the whole period, while the other had 3·55 per cent. of fat for the same time. The herd which produces the greatest quantity of milk does not necessarily produce it cheapest, for in this association with the herd with the greatest average yield of milk, viz., 33·3 lb. per day, the cost for food was 2·68*d.* per gallon, while in another yielding 30·16 lb. per day, each gallon produced cost for food 2·59*d.* per gallon. A study of these figures seems to indicate

that in many instances a great saving might be effected in the cost of producing milk. If even ½*d.* per gallon could be effected on the average of all milk produced, the gain to the country would be immense, and seeing that there is a difference between the highest and lowest of 2½*d.* per gallon in the cost of food, it should not be very difficult to effect this small saving. A well-known proverb is "that a penny saved is a penny gained," and in this case if ½*d.* per gallon of milk produced by a good milking cow could be saved on its food, a sum equal to from £1 5*s.* to £1 10*s.* would be gained on each cow

Fenwick District.—This parish lies north of Kilmarnock, and connected with it there are two milk record associations. For No. 1 a record has been kept of the food consumed during the past three years, while for No. 2 it is available for 1907 only. This is a district where all the milk is now sent to the large centres of population for consumption as milk, and on that account every farm produces more or less milk all the year round. In this case the cost of food consumed compared with the milk produced has been taken from the New Year to the middle of May. The period over which it extends is not only long enough to give fairly reliable results, but the results being available for three consecutive seasons afford an excellent opportunity for comparing the outlay for food required to produce a gallon of milk, not only on one farm compared with another, but on the same farm in different years, when the method of feeding was probably different.

On only two of the farms in the No. 1 Association were any turnips used, the average for these two being 21 lb. daily. The home-grown food most largely used all over the district is Timothy hay, which was consumed to the extent of 9·25 lb. daily, together with oat straw 5·7 lb., meals and cakes 8·43 lb., and bran or treacle 2·07 lb. More concentrated foods have been used here than in the Cumnock district and slightly less hay, but otherwise the ration does not materially differ from that in use in the Cumnock district.

For the whole three seasons the average cost for food of a gallon of milk has been 4·37*d.*, which is fully ¾*d.* per gallon more than it was in the Cumnock district for the spring months of the one season of 1907. It should, however, be noted that

in the Fenwick district milk was being produced during January and February, as well as in March, April, and May, as was the case in Cumnock, where testing only began at the beginning of March. Owing to the colder weather it is always more costly to produce milk during January and February than during March to May, and this probably accounts for the difference in cost of production.

It is worthy of notice that the herd giving the smallest yield of milk is also the one on which the largest amount was expended in food. This herd did not produce more milk in mid-winter than the others, so that the extra cost for food of each gallon of milk produced, compared with the others, was not due to the advanced period of lactation of the cows, as it might be, but principally owing to the excessive cost of feeding, compared with the capacity of the cows to yield milk. On this farm an average of 11·5 lb. of meals and cakes was used per cow per day, whereas the average of the others was 8·43 lb. While it is well known that each pound of concentrated food up to a certain weight per day may give a certain return in milk, each pound over that will give less and less increase until there is no gain at all, and if continued further, the quantity will not only not increase, but may decrease. The owner of this herd has the reputation of being a heavy feeder, and he seems to have been using much the same quantity all the three seasons for which the records have been kept.

The details of the food used among the members of the Fenwick No. 2 Milk Record Association are only available for one season, viz., 1907, but, like the other Association in this parish, they extend from the New Year to the middle of May. The results obtained are therefore comparable with those of the No. 1 Association. In No. 1 Association each gallon of milk produced cost 4·88*d.* for food, while in No. 2 the cost was 4·56*d.*, a difference of fully a farthing per gallon. This is brought about in the following way: in No. 1 Association the average yield of milk per cow per day was $1\frac{1}{4}$ lb. less than in No. 2, in spite of the fact that about 1 lb. of meal and 1 lb. of bran were consumed extra per cow per day. In this association there are three herds which have produced milk at a cost for food of from 3·14*d.* to 3·4*d.* per gallon, while there is one where the outlay is as much as 6·63*d.* per gallon, which is just double

what the cheaper ones have cost. Those who produce at the cheaper rate all use daily from 6½ to 7 lb. of mixed meals and cakes per cow, while the dearest one uses 10 lb., and another as much as 13 lb. daily. Wherever such large quantities of concentrated foods as these are used, the cost per gallon of milk produced is invariably increased and the poorer milkers the cows are the greater is the cost per gallon.

As far as our investigations have gone, it seems as if few if any purchased foods are so cheap at the rates stated as the more bulky ones, such as pasture, hay, straw, and roots grown on the farm. This is contrary to the generally accepted idea, and the practice of many good farmers, yet all available details steadily point in that direction. For instance, one of the cheapest produced milks since this work began was on a farm where in 1906 the daily ration consisted of 10 lb. of hay, 4½ lb. of oat straw, and 4½ lb. of mixed meals; whereas when the hay was reduced the following year, and the mixed meals considerably increased, the cost per gallon of milk was very much more. Two other farms having an almost equally low rate of cost used a ration almost identical in every respect. These indications should not be ignored, particularly when they happen again and again on different farms and in different years.

Lesmahagow District.—The Milk Record Association in this parish was only inaugurated this spring, and details regarding the costs for food are only available for three months. The district is one where some of the members used a large weight of turnips daily, while others had none at all. With three exceptions, all the herds consumed much more straw than hay, the average ration for the district being 8¾ lb. hay; 12 lb. oat straw; 39 lb. of turnips on the farms using them, 7¼ lb. of mixed meals and cakes, and 1½ lb. of bran and treacle. The average gallon of milk cost 5·93*d*., for food alone, while in Fenwick No. 2 Association the cost was 4·56*d*., in Fenwick No. 1, 4·88*d*., and in Cumnock 3·57*d*. per gallon, for much the same period of this year. In this association the milk from one herd cost 7½*d*. per gallon for food, in three others it was 6¾*d*. or over, while the lowest was 4·29*d*. The herd in which the highest cost for food per gallon of milk was incurred was almost the lowest milking one in the association;

while the one where the cost was least was the heaviest milking one, yet the cows of both herds were fed 10 lb. of meal daily, and an equal weight of hay, straw, and roots. Feeding cows in such a haphazard manner is certainly neither the way to make most out of the food or out of the cows, and clearly indicates what room there is for improvement in this direction. If one producer is able to make a profit and live, as this member seemed to do, after incurring an outlay for food of $7\frac{1}{2}d.$ on each gallon of milk produced, then those must have been doing extremely well who were producing at $3d.$ to $3\frac{1}{4}d.$ per gallon for food.

Kirkcudbright District.—A great part of the country in which the members of the Kirkcudbright and District Milk Record Association reside is much better suited for the growth of turnips than that of any of the associations hitherto referred to. The members, therefore, used them more freely than those in Ayrshire or Lanarkshire. With four exceptions all the members used turnips, and although not fed in very large quantity, still they formed a very much larger portion of the daily ration than any of those previously considered. The average weight of turnips consumed per cow per day on those farms where they were used was 35·6 lb.

This association only started at the beginning of April, so that the expert made only three visits to each farm before the cows went to grass. In the ration, hay was freely used on most of the farms, but meals or cakes were not fed to the same extent as in Ayrshire or Lanarkshire. The average daily ration was composed as follows :—Hay, 10 lb. ; oat straw, 5 lb. ; turnips, 35·6 lb. ; meals and cakes, 7 lb. ; and bran, $\frac{3}{4}$ lb. In the three associations in the southern counties the rates at which the home produce was valued were from 20 to 25 per cent. lower than those used in connection with Ayrshire and Lanarkshire, and this has correspondingly reduced the cost of production in these districts. Farmers sending dairy produce from these districts have to accept a lower price than if they had been nearer the seat of consumption, and have besides to pay higher rates for carriage on their milk and feeding stuffs. In consequence of these additional charges little extra profit remains, even although the cost of production is cheapened, as the one just about balances the other.

The yield of milk is generally very good, and the average cost of production for food is 3·66*d.* per gallon, of 3·52 per cent. of fat. The highest cost is 4·41*d.* per gallon, and the lowest 2·95*d.*, so that the variation is much less in this district than in some of those previously considered. This is no doubt in great part the result of the more uniform use of a moderate weight of meals, and a more free use of home-grown foods.

Castle Douglas District.—The members of the Stewartry Milk Record Association all reside within a moderate distance of Castle Douglas. The herds in this district are nearly all much larger than those in Ayrshire, the average being between 50 and 60, all of which are devoted to cheese making. The grass season here begins earlier than further north, but as testing began on 2nd March, the consumption of feeding stuffs was recorded for two months before the cows went to grass. Both hay and straw were largely used, turnips being fed to a greater extent than among the members of the Kirkcudbright Association, while concentrated foods, such as meals and cakes, were less used. The average ration was composed as follows :—Hay, 13·3 lb. ; oat straw, 14·2 lb. ; turnips, 40 lb. ; mixed meals and cakes, 5·8 lb. ; and bran, 1 lb. The average cost for food per gallon of milk produced was 3·92*d.* for milk of 3·4 per cent. of fat. The highest cost per gallon of milk was 4·81*d.*, while the lowest was 3·22*d.* The price at which milk sells in the neighbourhood leaves a very small margin over these prices, for labour, interest, depreciation, &c. The cost is probably unduly raised by the large quantity of hay and straw used, a considerable portion of which would probably go direct to the dung heap and contribute little to the food supply.

Wigtownshire.—The Lower District of Wigtownshire Milk Record Association began work on 2nd March, and a record of the food used was obtained for two months before the cows went to grass. Hay, straw, and turnips were more largely used than in any of the other districts, but except in turnips the ration used in this district does not differ materially from that used by the other associations in Galloway. More than half of the members used no hay at all, but those who did, fed an average of 14·4 lb. daily per cow. With one exception all used straw, the average of those using it being 16 lb. All

used turnips, the average consumption being 56·9 lb. per cow per day. The average weight of meals or cakes used was 5·4 lb. Only three used bran.

The average cost for food was 4·39*d.* per gallon for milk of 3·64 per cent. of fat. The highest cost was 4·88*d.*, while the lowest was 3·12*d.*, charges which are almost identical with those for the Stewartry, although almost ¼*d.* more than those of the Kirkcudbright district. It is also worthy of notice that while the lowest weight of meals and cakes has been used in this district, the percentage of fat in the milk, although not the highest, is still relatively high, notwithstanding the quantity of turnips which were used.

SUMMARY of the food consumed, and milk produced by the various Milk Record Associations in Scotland, for the winter and spring months up to May, 1907.

Association and Period of Record.	Average Milk per Day.	Average per cent. of Fat.	Average Cost of Food per Day in Pence.	Cost of Food per Gallon of Milk.	Cost of Food per Gallon of Milk of 3 per cent. of Fat.	Kind and Weight of Food Consumed per Cow per Day. Hay.†	Straw.†	Roots.*	Meals and Cakes.	Bran and Treacle.†
	lb.		*d.*	*d.*	*d.*	lb.	lb.	lb.	lb.	lb.
Cumnock, 1907 ...	27·55	3·47	9·71	3·51	3·03	10·4	5·4	18·0	6·7	1·3
Fenwick, No. 1, 1905	27·06	3·66	11·68	4·34	3·55	9·7	7·6	20·0	9·0	3·0
,, ,, 1906	24·67	3·48	9·86	4·06	3·49	9·1	6·8	14·0	7·7	1·3
,, ,, 1907	24·33	3·86	11·69	4·88	3·79	10·0	5·0	22·0	8·4	2·7
,, No. 2, 1907	25·51	3·68	11·57	4·56	3·74	10·8	7·1	13·5	7·5	1·9
Lesmahagow, 1907...	22·60	3·98	13·10	5·93	4·46	8·7	12·0	39·0	7·2	1·5
Kirkcudbright, 1907	26·84	3·52	9·77	3·66	3·12	9·9	5·1	35·6	7·0	0·7
Stewartry, 1907 ...	26·50	3·40	10·94	3·92	3·44	13·3	14·2	40·0	5·8	1·0
Wigtownshire, 1907	27·80	3·64	12·53	4·39	3·63	14·4	16·1	56·9	5·4	2·0
Average of nine ...	25·87	3·63	11·20	4·36	3·56	10·7	8·8	27·6	7·2	1·7

* The quantity of roots stated is not an average of all the farms, but only of those which used turnips.

† The averages given are not those for all the farms, but only those which used the food referred to.

The various milk record associations are very uniformly spread over the south-west of Scotland, and the average costs of production of milk may be taken as fairly representative of that part of the country. As time goes on everybody will become more accustomed to the work, and more attention will undoubtedly be devoted to the composition of the ration, so that greater accuracy and a cheapening of the cost of production is almost certain to follow.

DETAILS of the highest and lowest costs on individual farms.

Association and Period of Record.	Average Milk per Day.	Average per cent. of Fat.	Average Cost of Food per Day.	Cost of Food per Gallon of Milk.	Cost of Food per Gallon of Milk of 3 per cent. of Fat.	Remarks.
	lb.		*d.*	*d.*	*d.*	
Fenwick, No. 2, 1907	34·09	3·67	11·60	3·40	2·78	Herd where the yield of milk is highest
Lesmahagow, 1907 ...	16·10	4·25	9·69	6·02	4·25	Herd where the yield of milk is lowest
,, 1907 ...	16·10	4·25	9·69	6·02	4·25	Herd where the fat in the milk is highest
Stewartry, 1907 ...	26·50	3·17	11·42	4·31	4·08	Herd where the fat in the milk is lowest
Fenwick, No. 1, 1907	19·79	4·20	15·50	8·00	5·52	Herds where the cost per day is highest
,, No. 2, 1907	23·36	3·59	15·50	6·63	5·54	
,, No. 1, 1906	20·95	3·65	6·00	2·86	2·35	Herd where the cost per day is lowest
,, ,, 1907	19·79	4·20	15·50	8·00	5·52	Herd where the cost per gallon is highest
Cumnock, 1907 ...	30·16	3·55	7·81	2·59	2·19	Herd where the cost per gallon is lowest
Fenwick, No. 1, 1906	19·29	3·65	13·50	7·00	5·75	Herd where the cost per gallon is highest for 3 per cent. of fat
Cumnock, 1907 ...	30·16	3·55	7·81	2·59	2·19	Herd where the cost per gallon is lowest for 3 per cent. of fat

Summer Milk.—When the milk records of 1903 were in progress, the experts in charge of the three stations at work during the summer of that year were asked to find out the number of acres of pasture and their rental which were grazed by each herd. Almost the whole of the milk which was recorded during that season was the produce of pasture, as little concentrated feeding stuffs were used. When the total rental of the fields used by the cows alone was divided by the total number of gallons of milk produced during the six months over which the testing extended, it was found that the cost for food for most of the herds was under $1\frac{1}{2}d.$ per gallon of milk. When this is compared with $4·36d.$, the average cost for food during the first five months of the year, at nine stations and during various years, it will be seen that at present prices there is less margin for profit in winter milk than that of summer. During summer the charges for labour are much lower than in

winter, and when to the latter are added 3*d*. per gallon for extra cost of food during winter time, it will be seen that even at the higher prices of winter milk probably less is left for profit than that produced during summer and sold at a lower rate.

The Costs of Production Abroad.—All over Denmark, Sweden, and Norway there is an accepted scale of what are called food equivalents, by which certain weights of various foods are considered equal to one another for use in the production of milk or butter. The following is the scale in general use:— 1 lb. oil cake, 1 lb. mixed grain, 10 lb. mangolds, 2½ lb. hay, 6 lb. straw.

Each of these is presumed for the purpose of comparison to be worth 5½ ore, which is equal to about ¾*d*. As, however, the Danish pound is somewhat heavier than the Imperial one, the value works out to about ⅘*d*. per food equivalent. On this basis the production of a gallon of milk does not seem to differ so much in average cost in these countries from our own as many are inclined to believe, and if the basis on which the Scandinavian food equivalents are valued is correct and the quantities of foods used here are accurately estimated and valued, we seem to produce milk about as cheaply as they do, at least so far as consumption of food is concerned. The averages of the food consumed and milk produced by several hundred milk record associations in various districts have been submitted to me by friends in different parts of the country and worked out by several of them and by myself. The average cost for food is somewhat as follows:—

	d.		
Zeeland	4·4	per gallon of 10 lb.	Imperial.
*Fyen	4.25	,,	,,
† ,, ...	4·69	,,	,,
Jutland	4·7	,,	,,
Norway	4·5	,,	,,
Scottish Milk Record Associations ...	4·36	,,	,,

* For one set of figures.
† Another.

In proportion to the food consumed, all cows will give more milk three months after calving than at any other time of their lactation. In the Scottish milk record associations with which the foregoing figures deal, a large proportion of the cows calved during the spring months, and on that account the two

sets of figures should not be too closely compared. Had the Scottish figures been compiled for the autumn months instead of the spring ones, a very different price would have been recorded. From the middle of May to the end of September our costs for the production of milk will be less per gallon than any of the Danish ones, so that when the average for the whole year is taken, the difference will probably be very small. It is hoped that at an early date it will be possible to give the costs for a whole year, when our costs for food can be more fairly compared with those of Denmark than at present.

In Scotland the cost of labour and interest on capital are considerably higher than in Scandinavia. Most classes of concentrated feeding stuffs are if anything cheaper with us, while the home-grown foods are sometimes cheaper and sometimes dearer. Ayrshire cows give richer milk than those in the countries referred to, the average percentage of fat on which the foregoing figures are based being, Zeeland, 3·44; Fyen, 3·43; Jutland, 3·41; Scotland, 3·63 per cent.

It must be pointed out that in the Scandinavian averages the percentage of fat is that for the milk of the whole year, whereas the Scottish ones are for the period over which the cost for food extends, viz., the spring months. During the period that pasture is at its best in Scotland, say according to district from the last week in May to the middle of June, while the quantity of milk yielded by the cows is at its maximum, the quality (other things being considered) is at its minimum. In cheese-making herds the quality increases very materially in autumn, and had the whole year been considered for Scotland, the percentage of fat would probably have been somewhat increased. The average fat for 443 cows in the Fenwick No. 1 Milk Record Association for the whole year 1905 was 3·74 per cent. and the average for the whole of the south-west of Scotland where Ayrshires alone are kept, will not differ materially from this. Our heavier outlays for labour, interest, &c., are therefore in great part discounted by the higher percentage of fat in our milk and the extra cost of conveyance to our markets which the foreigner has to bear.

Our cheapest food is evidently pasture, whereas in Scandinavia there is considered to be little difference in the cost of keeping cows in summer and winter, as pasture does not do

so well there. Hay with us is no doubt more bulky than with them, but they usually have very much better weather for making it, and in consequence it is generally superior to ours. The reverse happens in regard to straw, as owing to our cooler summers, our oat straw is much more palatable than theirs. It should also be kept in view, in criticising the foregoing figures from any point of view, that owing to the longer period over which the Danish milk records have extended and the greater number of cows embraced in them, the Danish figures are likely to be more reliable than ours.

Owing to proximity to, or distance from markets, every country has districts where high prices prevail, and others where they are low. For equal quality the feeding value of an article of home growth is the same in all these districts, so that the Danish system of calculating the cost by food equivalents is a much easier and more satisfactory one than is ever possible by putting a separate money value on each food. In the south-west of Scotland bean meal is the concentrated food most largely in use, and if it were taken as a basis and feeding equivalents agreed on for the other substances, comparisons between districts would be much more reliable than they are at present.

CHERRY LEAF SCORCH.

E. S. SALMON, F.L.S.

(*Mycologist to the South Eastern Agricultural College, Wye, Kent*).

About 1900 the fungus disease known as cherry leaf scorch (*Gnomonia erythrostoma* (Pers.) Auersw.) attracted the attention of Mr. W. Carruthers, F.R.S., Consulting Botanist to the Royal Agricultural Society of England and of Prof. J. Percival.

Mr. Carruthers published* an illustrated description of the fungus, and stated that the disease was causing considerable injury in cherry orchards in certain districts of Kent. The remedy recommended was the systematic collection and burning of the diseased leaves (which, as pointed out below, remain attached to the boughs instead of falling in the autumn) in all the orchards in the affected areas. Mr. Carruthers wrote: "The removal and burning of the dead leaves has been successful on the Continent, and there is no reason why it should not be equally successful in Kent. No doubt this must

* *Journ. Roy. Agric. Soc. England*, Vol. 62, p. 245 (1901).

entail much trouble and considerable expense. But the neglect of undertaking this operation, though costly, means the disappearance of the cherry orchards of Kent in a very few years." In a few cases where growers followed this advice an immediate cessation of the disease resulted.

Prof. Percival, in his article* on the disease, attributed the visitation to the exceptionally dry seasons experienced about that time. With regard to remedies, Prof. Percival dismissed the method of the collection and burning of the diseased leaves as impracticable, and wrote "growers of cherries must be content to wait for the advent of climatic conditions more suited to vigorous growth than those of the last two or three seasons, during which the fungus has become prevalent."

In 1906, when appointed to the newly created post of mycologist at the South-Eastern Agricultural College at Wye, I found that the disease still persisted in many of the orchards where it had occurred in 1900–02, and also that fresh areas had become affected.

Since the remedy of the collection and burning of the diseased leaves secures the eradication of the disease in a district only if carried out rigidly over the whole of the affected area, and since the necessary energy and co-operation on the part of growers to carry out this work was unfortunately not to be looked for, other means had to be devised. It was obvious, too, that as the disease had persisted in some orchards in certain districts for fifteen consecutive years, during which time the trees had been rendered practically useless, growers could not be advised merely to wait for more favourable seasons.

There remained the expedient of spraying. In 1906 I carried out spraying experiments with the fungicide known as Bordeaux mixture, when it was found that the present disease yields readily to such treatment.

Before describing these spraying experiments it will be well to give a brief account of the life-history of the fungus which causes cherry leaf scorch and of the characteristic features of the disease.

Cherry orchards attacked by this fungus can be at once recognised in the winter and early spring months by their peculiar appearance, due to the fact that the dead leaves

* *Journ. South-Eastern Agric. College*, No. xi, p. 83 (1902).

of the previous season are still hanging on the branches of the trees. In severe attacks scarcely a leaf falls from the diseased trees in the autumn, so that at the beginning of winter the affected orchard at a distance might be taken to be composed of trees which had been suddenly killed in full vigour of growth, the leaves having remained attached just as we find that the withered leaves remain on a severed branch. During winter, driving rains and snow and gales strip off a few of the dead leaves or cause them to rot, but so resistant are the diseased leaves and so firmly attached to the branch that in the spring, at the time when the new leaves are beginning to appear, a very considerable number of the leaves of the previous season are still hanging on the tree. Fig. I is a photograph of a diseased tree taken towards the end of winter, and shows the large number of dead leaves still hanging on the boughs. Although partly obscured from sight by the new leaves, clusters of dead leaves can be found on such a diseased tree through its period of blossoming right on to the time when the cherries are ripening.

Now these dead leaves are those which have been attacked when living by the fungus *Gnomonia erythrostoma*. They still, when dead, bear the fungus, and it is by these leaves alone that the disease is carried on from one season to the next.

A diseased leaf gathered from a tree in the spring months shows a number of minute black points, just visible to the naked eye, scattered over its lower surface.* Each black point is the beak of one of the fruit-conceptacles of the fungus (see *d* in Fig. IV (1)). In the conceptacle we find a large number of minute sacs (*asci*), each containing eight winter-spores (*ascospores*). In Fig. IV (1) a conceptacle of the fungus is cut open down the middle to show its contents; at 2 an *ascus* and four *ascospores* are shown; at 3, four *ascospores* germinating after being kept for 48 hours in a decoction of plum juice.

The conceptacles are formed in the autumn, but are then immature; they ripen gradually during the winter months, until by spring, at the time when the new leaves are unfolding,

* Accompanying the Cherry Leaf Scorch fungus may be found, almost without exception, a totally distinct fungus, which can be easily distinguished superficially by its much smaller size, and by being densely clustered. This fungus is, I believe, a species of *Mycosphaerella*.

the contained spores are perfectly ripe and ready to infect a leaf. These spores are then ejected with considerable force

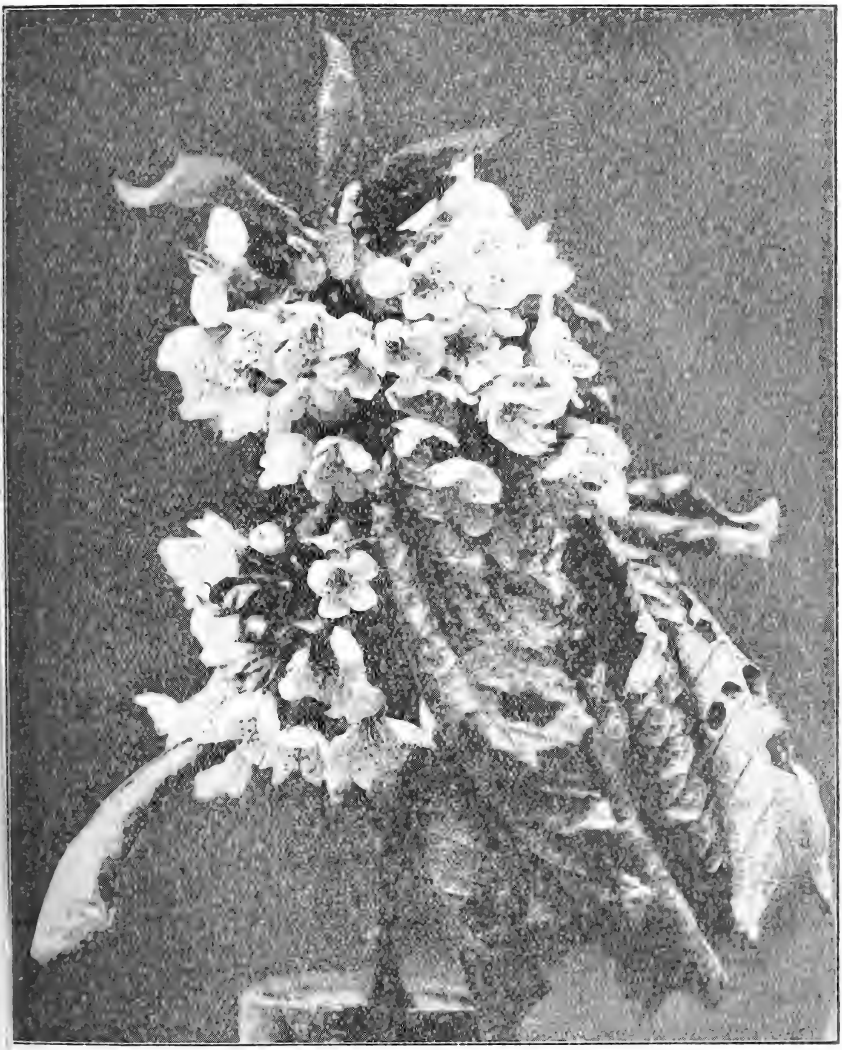


FIG. 3.—Photograph of a flowering branch of a cherry-tree attacked by the Cherry Leaf Scorch fungus. The old, dead leaves, seen below the flowers, have remained attached to the branch through the winter, and bear many hundreds of the fruit-conceptacles of the fungus. These conceptacles become ripe during the spring, and forcibly eject spores, which infect the young unfolding leaves, seen above the flowers.

from the mouth of each conceptacle. Owing to the fact that the old dead leaves bearing the fungus remain attached to the branch, the spore-ejecting conceptacles are in close proximity

to the new leaves. In Fig. III we see at the base of the flowering shoot a number of old dead leaves; each of these leaves, it must be noted, bears mature fruit-conceptacles of the fungus, from which ripe spores are being ejected. Above the flowers we see the young leaves unfolding. When we remember that each dead diseased leaf bears many hundreds of fruit-conceptacles, and that each conceptacle contains a large number (50 to 100 or more) of sacs, each with eight spores, it is easy to understand how the reinfection of the leaves of a tree takes place regularly year after year, unless preventive steps are taken.

When one of the spores reaches the surface of a young leaf it germinates at once and, piercing the epidermis, gives rise within the leaf to a vegetative spawn (*mycelium*). This spawn spreads among the leaf-cells, and feeds on them. Large yellow flecks are soon formed in the attacked leaf, and on these spots small conceptacles, filled with minute, long, curved spores, are developed during the summer. This is known as the *Septoria* stage of the disease. After some months the yellow patches turn brown, and eventually the whole leaf dies, curling up and presenting a scorched appearance. Previous to this the spawn of the fungus has invaded also the cells of the leaf-stalk, penetrating right down to the branch on which the leaf is borne. Now, in the case of a healthy leaf, it is the cells at the base of the leaf-stalk which play the chief part in the process of the detachment of the leaf in the autumn. It is in consequence of the growth of the fungus down the leaf-stalk, and the injury it inflicts there, that the normal process of defoliation is made impossible in trees afflicted with cherry leaf scorch, with the result that the diseased leaf remains firmly attached to the branch until it rots away in the course of the following summer.

The cherry itself is often attacked, when it either soon falls off or becomes more or less distorted, and develops hard spots in the flesh.

Trees which have suffered from the disease for a number of years show a weak growth of wood, due to the leaves infested by the fungus having been turned to a sickly yellow colour, and so prevented from carrying out during the summer months their normal functions in assisting the growth and ripening

of the wood, which consequently becomes dwarfed from want of food; an increasing quantity of dead wood accumulates, and the tree may finally be killed.

At the present time cherry leaf scorch is seriously affecting orchards in certain districts in Kent. The affected area lies, roughly speaking, within an oval, the bounding line of which runs from Paddock Wood a little east of Maidstone nearly to Sittingbourne, thence a little south of Faversham nearly to Canterbury, and back keeping to the north of Ashford to Paddock Wood.

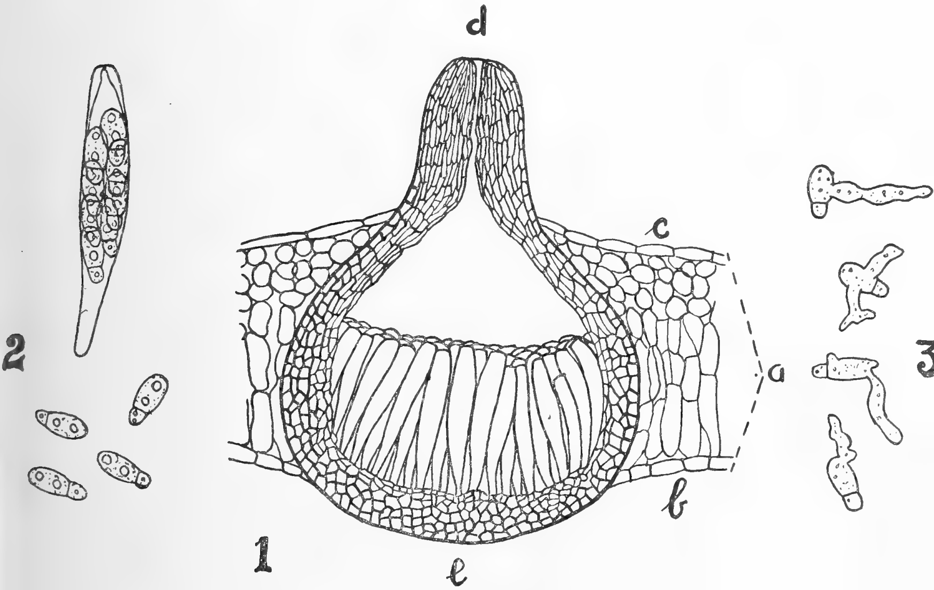


FIG. 4.—(1) Section of a diseased cherry leaf, cutting through the middle of one of the fruit-conceptacles of the fungus; (*a*), the cells of the leaf; (*b*), the upper surface of the leaf; (*c*), the lower surface; (*d*), beak of the conceptacle of the fungus; (*e*), its base. Within the conceptacle can be seen the crowded mass of little sacs (*asci*). (2) One of the *asci* more highly magnified, showing the eight winter-spores (*ascospores*) it contains; also, below, four free *ascospores*. (3) *Ascospores* germinating after being kept in a decoction of plum-juice for 48 hours.

The disease is most severe and persistent in orchards on soils inclined to be poor and shallow. It is very prevalent on the Lower Greensand ("ragstone") range of hills from Pluckley, near Ashford, to Otham, Langley and Leeds. Another district where considerable injury has been inflicted, and where the disease has recurred annually, is the tract of country lying between Lenham and Faversham (Milsted,

Doddington, Bluetown, &c.). In several orchards here the disease, which was noticed first about 1900, has maintained its severity for the past six years, and in many cases trees which if healthy would now be in full bearing have had to be grubbed up or grafted.

Taking the affected area generally, it is found on inquiry that only a very poor crop of fruit, or frequently no crop at all, has been obtained from the orchards since they have been affected. This fact has been noticed by the men working regularly among the fruit, who in many districts have told me that no cherries are picked from the orchards "where the dead leaves hang on." The belief is firmly held in nearly all the districts where the disease occurs that the leaves remain attached to the tree as the result of injury due to an early frost in autumn before the wood is properly ripened. As a consequence no efforts have been made to remove the real cause of the disease.

It is usually somewhat difficult to ascertain exactly when the disease first appeared in a district. It is certain that in some places the disease is of long standing. Mr. F. Smith, of Loddington, tells me that he remembers the disease existing at Stockbury and in orchards in the neighbourhood "thirty or forty years ago." In this instance it seems probable that the disease occurred intermittently. In one orchard at Charing Heath the leaves were first noticed to hang on the trees through the winter in 1890; the disease increased year by year, and now a number of trees are practically killed. On the other hand, it seems certain that the disease has recently (probably in the years 1900–02) extended its area to a considerable extent, and invaded orchards in districts previously free from it.

In some cases where the orchards are on good deep soil the trees on being attacked have proved able to throw off the disease after a few seasons. On less favourable cherry ground, however, the disease after its appearance recurs annually, weakening the trees and rendering them specially liable to severe attacks of the "brown rot" fungus (*Sclerotinia fructigena*). Cherry leaf scorch is not, however, restricted to orchards on poor soil. At Norton, three miles west of Faversham, the disease appeared about six years ago in an

orchard on quite good cherry ground, it recurred annually, and in 1906 the trees were decidedly more diseased than they had been previously. It is hardly to be doubted that if a season comes specially favourable to the fungus it will invade to some extent the famous orchards of Sittingbourne and district, the fungus spreading from the large tract of badly diseased orchards close to them on the south.

Nearly all the varieties of sweet cherries, *e.g.*, Frogmore Bigarreau, Waterloo, Clusters, Eltons, Blackhearts, are liable to be attacked by cherry leaf scorch, but acid cherries (such as the Flemish, Morello and May Duke) have so far proved quite immune to the disease, even when growing in the midst of the worst affected orchards. Among sweet cherries, however it is interesting to find that two varieties have proved in several orchards to be either wholly immune, or almost immune, to the disease ; these are the Turk and the Napoleon. In one orchard of about three acres, alternate rows of Turks and Waterloos had been planted. The trees are now about sixteen years old ; about five years ago the disease appeared on the Waterloos, and steadily increased each succeeding year, until scarcely a single leaf fell from the trees in the autumn, and the cherries themselves were ruined through the fungus forming blackish " scabby " spots in the flesh. These Waterloos have now been cut down and regrafted. During the whole time, *i.e.*, through the five years while the disease spread and was at its worst, the Turks remained practically free from the disease. In another locality a number of Frogmore Bigarreaus suffered from the disease continuously for fifteen years until they were quite useless and nearly dead ; during these years the Napoleons in the same orchard remained quite free. The resistance to disease of certain varieties is a fact of considerable importance in connection with the regrafting of diseased trees.

As I have personally observed, the wild cherry (*Prunus avium*) is sometimes attacked, and trees may occasionally be found in woods (usually near the outside) and hedges with dead leaves, bearing the fungus, hanging on the boughs through the winter months. The fruit of such diseased wild trees may be severely attacked, as was the case this season with trees in Olantigh Park, near Wye. Such wild trees, however, appear to be capable of throwing off the disease in a year or so, while the cultivated varieties of the cherry are often not able to do so.

Outside of Kent the disease seems little known; Mr. Carruthers has recorded* it on a wild cherry tree in Somersetshire, and I have seen it on sweet cherries in a garden at Coleman's Hatch, Sussex.

Remedies.—The fungus depends absolutely for the continuance of its existence on fresh infection taking place in the spring by means of the spores scattered from the fruit-conceptacles of the fungus on the dead leaves hanging on the tree. The spawn of the fungus stops short at the base of the leaf-stalk and never enters the branch, so that no wood becomes diseased. If, therefore, during autumn or winter the dead leaves hanging on the affected trees are collected and destroyed the orchard stands perfectly free from disease again.

Another way of dealing with the disease is to prevent the infection of the leaves in the spring by covering them with a coating of some fungicide. This method of dealing with the disease by spraying, which, so far as I know, had not hitherto been tried, was employed in an experiment last year. Thirteen trees were chosen standing in the middle of an affected orchard belonging to Mr. A. Pearson, of Pevington, Pluckley, Kent. The trees in this orchard had been severely attacked by cherry leaf scorch since 1903. Using the Wye College spraying apparatus (consisting of the Goulds Manufacturing Company's "Pomona" pump, fitted with the "Seneca" nozzle supplied by the same firm), two thorough applications of Bordeaux mixture, in a fine misty spray, were given to these thirteen trees. The Bordeaux mixture was made according to the following formula: copper sulphate, 8 lb.; freshly burnt quicklime, 8 lb.; water, 100 gallons. The first application was given just before the flowers opened and the second soon after the petals had fallen. Nothing more was done to the trees. In the following winter the surrounding trees were as badly affected with the disease as ever, the majority of the leaves remaining unshed. Plate I shows a photograph of one of the unsprayed trees standing in the next row to the sprayed trees. The thirteen sprayed trees presented the appearance seen in Plate II, which shows a photograph of one of them; only a few leaves remained unshed from the branches, and the trees consequently were nearly restored to health.

* *Journ. Roy. Agric. Soc., England,* Vol. 63, p. 290 (1902).

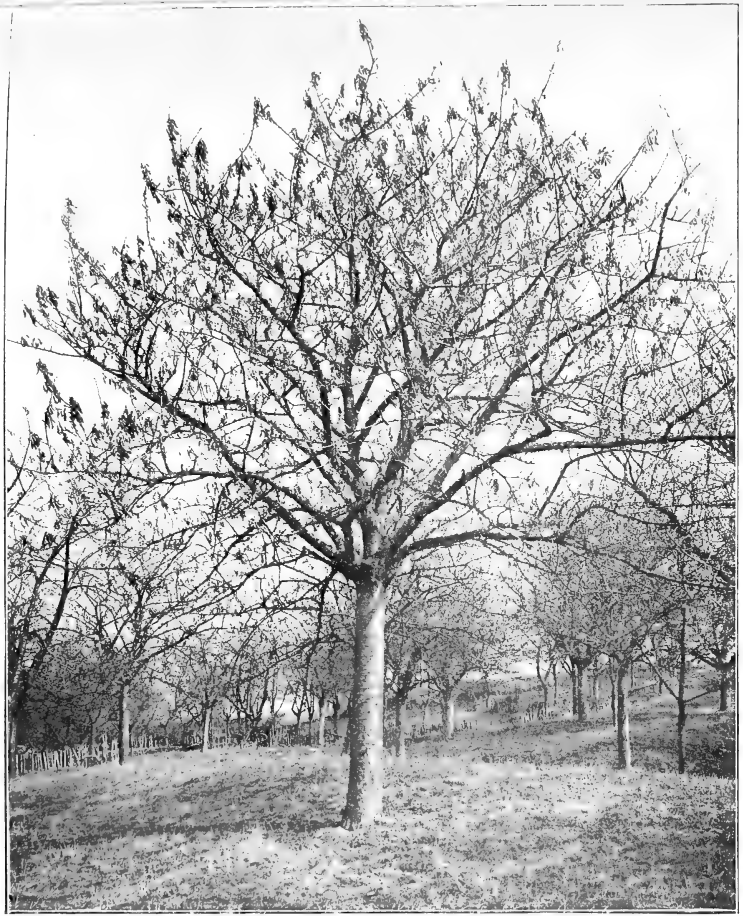


Fig. 1.—Cherry Leaf Scorch.—Unsprayed.

Fig. 2.—Cherry Leaf Scorch.—After Two Sprayings with Bordeaux Mixture.

The great improvement shown by the tree in Plate II as compared with that in Plate I was obtained simply by two thorough applications of Bordeaux mixture, and when it is remembered that this tree (and the remaining twelve trees, which presented the same appearance) stood throughout the season surrounded by diseased trees, and thus exposed for many weeks to continual infection, the efficacy of this fungicide against the present disease is clearly demonstrated. A quicker and more complete recovery might be expected in a case where the whole orchard was thus sprayed.

It seems clear that we can eradicate this disease in an orchard by a few thorough sprayings with Bordeaux mixture, and that the owners of the numerous cherry orchards (scattered over a considerable area in Kent) now becoming unproductive in consequence of the injury caused by cherry leaf scorch have in their hands a cheap and easy method of quickly restoring them to health.

It must be pointed out, however, that so long as the disease is allowed to flourish generally in the numerous orchards in the affected districts annual sprayings will be required to keep any one orchard clean, and the root of the evil will remain practically untouched.

There is no doubt that the scientific, and at the same time the most economically sound, method of dealing with this infectious plant disease, which is limited to a definite area, would be to ensure its eradication by the simultaneous collection and burning in early winter of the diseased leaves hanging on the trees in all the orchards over the affected area, such measures being carried out co-operatively by the growers under State supervision. This method has been successfully employed abroad. An epidemic of the present disease occurred about 1880 over an extensive area of country between Harburg and Stade, in one of the best fruit growing districts of Prussia. After the disease had ravaged the orchards for six years, and increased in virulence to such an extent that in many orchards not a single leaf fell from the trees in the autumn, the Government stepped in and put the matter in the hands of Prof. B. Frank, an eminent mycologist of Berlin. Prof. Frank, who was the first to work out the life-history of the cherry leaf scorch fungus, recommended the collection and burning in

winter of the diseased leaves hanging on the trees over the whole of the affected district. The Government followed his advice and dealt with the matter energetically. Government notices were posted over the whole district enforcing the compulsory picking off and burning of the dead leaves before February. These measures at first met with much opposition, due to the ignorance of the fruit growers. Through the employment by the Government of competent scientific men, however, confidence in the method was soon obtained from the growers, who finally gave hearty support in carrying out the work rigorously. The measures were put in force for two successive years, and proved entirely successful; in the third season all the cherry orchards—for the first time for eight years—stood healthy again and completely restored to their former productiveness.

It must be pointed out, however, that certain special conditions (*e.g.*, the overcrowding of the trees and the presence of numerous open ditches near the orchards) which obtain in the district in Prussia where the epidemic above mentioned occurred, doubtless render the disease more dangerous there than it is in this country.

AGRICULTURAL RETURNS OF 1907.

The preliminary statement of the acreage and live stock returns issued by the Board on the 26th Aug. last shows that the total acreage under crops and grass in Great Britain amounted to 32,244,110 acres in 1907, this figure representing a decline of 22,645 acres from the area so returned in 1906. The changes in the extent of arable and pasture land respectively, and in the chief categories of crops, may be summarised as follows:—

Crops.	1907.	1906.	Increase or Decrease.	
	Acres.	Acres.	Acres	Per cent.
Cereal Crops	6,997,700	7,057,538	− 59,838	− 0·8
Other Crops	3,215,702	3,209,200	+ 6,502	+ 0·2
Clover and Rotation Grasses	4,491,028	4,440,746	+ 50,282	+ 1·1
Bare Fallow	261,437	314,537	− 53,100	− 16·9
Total Arable... ...	14,965,867	15,022,021	− 56,154	− 0·4
Permanent Pasture	17,278,243	17,244,734	+ 33,509	+ 0·2
Total	32,244,110	32,266,755	− 22,645	− 0·1

There is a decline of some 60,000 acres in the area under cereal crops, which reduces the surface to a figure slightly under 7,000,000 acres. Other crops—excluding clover and rotation grasses—show a small increase of 6,500 acres, and clover and rotation grasses an increase of 50,000 acres or slightly over 1 per cent. The most noticeable change is observable in bare fallow, where the decline amounts to 17 per cent. This, following upon a decrease of 10 per cent. in 1906, reduces the area so returned to 261,000 acres, the smallest figure on record, or 32,000 acres less than the lowest previously returned in 1902. The decrease in the arable land of Great Britain amounts on the whole to 56,000 acres, proportionately the same as in 1906, or less than ½ per cent., of which about three-fifths, or 34,000 acres, have been laid down to permanent pasture.

Among the cereal crops, wheat shows a decrease of 130,000 acres, or nearly 7½ per cent. ; but the area under barley has lost practically what it recovered last year, the figure now standing at 1,712,000 acres, or 1,000 acres less than the area devoted to this crop in 1905, and the acreage of the present year is the lowest figure ever recorded. Oats, for the first time since 1904, show an increase, which amounts to some 80,000 acres, or 2½ per cent., and the area under this cereal now stands at 3,123,000 acres.

The detailed figures regarding the corn crop are as follows :—

Crop.	1907.	1906.	Increase or Decrease.	
	Acres.	Acres.	Acres.	Per cent.
Wheat	1,625,488	1,755,696	− 130,208	− 7·4
Barley	1,712,166	1,751,238	− 39,072	− 2·2
Oats	3,122,936	3,042,926	+ 80,010	+ 2·6
Rye	61,211	64,808	− 3,597	− 5·6
Beans...	309,761	288,891	+ 20,870	+ 7·2
Peas	166,138	153,979	+ 12,159	+ 7·9

Beans again exhibit an increase, while peas have recovered some of the area lost last year. In the case of the former crop the addition reaches 21,000 acres, or slightly over 7 per cent., and the total area is the largest recorded since 1892, when the acreage under beans was 311,000 acres or some 1,500 acres in excess of the present year's returns.

Among other crops potatoes again show a decline, but not to such a marked degree as in 1906, the deficit this year being

17,000 acres, or 3 per cent. The area now under potatoes is, however, the lowest returned since 1899, when the figure was 1,200 acres less than that recorded for the present year.

The green and other crops may be summarised as under :—

Crop.	1907.	1906.	Increase or Decrease.	
	Acres.	Acres.	Acres.	Per cent.
Potatoes	548,921	565,921	− 17,000	− 3·0
Turnips and Swedes ...	1,563,031	1,590,920	− 27,889	− 1·8
Mangold	450,063	431,458	+ 18,605	+ 4·3
Cabbage and Kohl Rabi ...	95,584	88,082	+ 7,502	+ 8·5
Rape	91,273	93,830	− 2,557	− 2·7
Vetches or Tares	154,058	142,047	+ 12,011	+ 8·5
Lucerne	63,796	55,734	+ 8,062	+ 14·5
Hops	44,938	46,722	− 1,784	− 3·8
Small Fruit	82,167	80,226	+ 1,941	+ 2·4
Other Crops	121,871	114,260	+ 7,611	+ 6·7

Turnips and swedes continue to show a decline; a loss of 28,000 acres, or nearly 2 per cent., having to be recorded, and the area devoted to the growth of these roots—1,563,000 acres—is the lowest on record. Mangolds, on the other hand, again show a greater breadth, and the addition of nearly 19,000 acres, or $4\frac{1}{4}$ per cent., brings the acreage up to the highest ever returned, nearly 9,000 acres in excess of the previous largest return in 1902. All other crops, with the exception of rape and hops, have been extended, the principal additions being seen in lucerne and vetches. The decrease in hops, though not so great as in 1906, amounts to nearly 4 per cent., and continues the decline which has been in progress since 1899, with one slight check in 1905; and the present year's acreage is the lowest ever recorded.

The figures relating to temporary and permanent grass are shown in the next table :—

Crop.	1907.	1906.	Increase or Decrease.	
	Acres.	Acres.	Acres.	Per cent.
Clover and Rotation Grass (for hay)	2,250,371	2,191,587	+ 58,784	+ 2·7
Ditto (not for hay)	2,240,657	2,249,159	− 8,502	− 0·4
Total	4,491,028	4,440,746	+ 50,282	+ 1·1
Permanent Grass (for hay) ...	4,936,823	4,784,895	+ 151,928	+ 3·2
Ditto (not for hay)	12,341,420	12,459,839	− 118,419	− 1·0
Total	17,278,243	17,244,734	+ 33,509	+ 0·2

Both rotation grasses and permanent grass have increased their area, and the extent reserved for hay is greater than last year by 210,000 acres, the actual increase being for the most part in permanent grass, though the relative additions are somewhat similar. Of the area for grazing both categories show a decline; that in rotation grass amounting to 8,000 acres and in permanent grass to 118,000 acres.

Among the live stock, increases have to be recorded in sheep and pigs, and decreases in horses and cattle. From the subjoined table it will be seen that there is a decrease in each of the categories into which horses are divided, the decline being greatest among the unbroken horses under one year old:—

Horses.	1907.	1906.	Increase or Decrease.	
	Number.	Number.	Number.	Per cent.
Horses used for Agricultural Purposes	1,115,962	1,116,505	− 543	− 0·0
Unbroken Horses (one year and above)	313,961	315,235	− 1,274	− 0·4
Ditto (under one year) ...	126,484	136,941	− 10,457	− 7·6
Total	1,556,407	1,568,681	− 12,274	− 0·8

In cattle a total decline of 98,000 head is noticed; but the decrease is confined to cattle other than the breeding and dairy stock, in which an increase of 21,000 head is shown, and the figure now returned is again the highest on record. Among the other categories the decrease is most marked, actually and relatively, in the one year old and under two years, where it amounts to slightly over 3½ per cent.

Cattle.	1907.	1906.	Increase or Decrease.	
	Number.	Number.	Number.	Per cent.
Cows and Heifers in Milk or in Calf	2,759,318	2,738,411	+ 20,907	+ 0·8
Other Cattle (two years and above)	1,389,282	1,426,754	− 37,472	− 2·6
Ditto (one year and under two)...	1,440,433	1,494,795	− 54,362	− 3·6
Ditto (under one year) ...	1,323,486	1,350,896	− 27,410	− 2·0
Total	6,912,519	7,010,856	− 98,337	− 1·4

The number of sheep again shows an increase, and the total now returned is the highest since 1901. All categories

have increased, and the number of ewes kept for breeding is now larger than in any year since 1900.

Other sheep, one year old and above, have increased by 95,000, or nearly 2 per cent., while lambs have been augmented by 385,000, or $3\frac{3}{4}$ per cent.

Sheep.	1907.	1906.	Increase or Decrease.	
	Number.	Number.	Number.	Per cent.
Ewes kept for breeding ...	10,277,428	10,061,104	+ 216,324	+ 2·2
Other Sheep (one year and above	5,194,029	5,098,876	+ 95,153	+ 1·9
Ditto (under one year) ...	10,645,046	10,260,380	+ 384,666	+ 3·7
Total	26,116,503	25,420,360	+ 696,143	+ 2·7

The largest relative additions to the stock of the country has, however, to be noted in pigs, and an increase of $13\frac{1}{2}$ per cent., or 313,000 swine, has been recorded. The total is now 2,636,808, of which 380,272 are sows kept for breeding.

IMPORTS OF GRAIN IN THE CEREAL YEAR, 1906–7.

At the end of August, it may be assumed without much risk of error that the stocks of wheat and other grain remaining in farmers' hands from the harvest of the previous year are practically exhausted. The close of the cereal year, which may be reckoned as extending from 1st September to 31st August, affords therefore a convenient opportunity for considering the extent to which this country has been dependent on the Colonies and on foreign countries for grain to supplement the home production of 1906.

The yield of wheat in the United Kingdom in 1906 amounted to 7,577,000 qrs., a very similar quantity to that produced in 1905, viz., 7,542,000 qrs., and the imports for the two cereal years have also been approximately alike. In 1905–6 the quantity received was 94,558,000 cwts., while in the year 1906–7 which has just ended it was 94,737,000 cwts. Converting these figures into quarters (of 480 lb.), the total supply of home and foreign wheat was 29,682,000 qrs. in 1906–7 as compared with 29,606,000 qrs. in 1905–6. To this must be added the imported wheat-meal and flour, viz., 13,221,000 cwts. in 1906–7 and 14,433,000 cwts. in 1905–6, quantities which

may be taken as equivalent to 4,284,000 qrs. and 4,677,000 qrs. respectively of wheat grain, making with the imports and the home production a total available for consumption of 33,966,000 qrs. of wheat in 1906–7 and 34,283,000 qrs. in 1905–6. Similar calculations for the two preceding years show that the aggregate quantity available, exclusive of stocks carried over, was 34,063,000 qrs. in 1903–4 and 32,796,000 qrs. in 1904–5, the lower figure of the latter year being largely accounted for by the inferior harvest of the United Kingdom in 1904. On the whole it will be seen that the amount available for consumption during the past four years has shown no very great variation.

With regard to the countries contributing to the supply, the receipts from each of the principal sources are given in the following table :—

Country of Export.	Thousands of Cwts.			
	1906–7.	1905–6.	1904–5.	1903–4.
India	14,613	11,743	29,083	23,144
Russia	12,843	18,377	28,823	19,331
Argentina	22,179	22,890	24,085	17,490
United States	20,319	17 917	4,558	12,897
Canada	11,085	11,177	3,547	8,355
Australia	7,769	7,488	12,758	6,322

The Argentine Republic occupied for the second time the position of principal exporter to this country and furnished 22,179,000 cwts. compared with 22,890,000 cwts. in 1905–6 and 24,085,000 cwts. in 1904–5. The second place was taken by the United States, which showed a further recovery from the very low figures reported in 1904–5. The effects of the poor Russian harvest are shown by the comparatively small receipts from that country, while those from India, though greater than in 1905–6, were also inferior to the two preceding years. The contributions from Canada approached very closely to the maximum figure yet recorded, while those from Australia were good though not exceptional.

The average price of imported wheat was £1 10*s*. 5*d*. per qr. in 1906–7, compared with £1 10*s*. 9½*d*. in 1905–6, the total value of the wheat imported in the past year being £33,648,000 as compared with £33,952,000 in the preceding period.

The imports of the principal cereals in each of the past ten harvest years are given in the table below :—

Harvest Year.	Millions of Cwts.				
	Wheat.	Wheat-flour.	Barley.	Oats.	Maize.
1906–7	94·7	13·2	19·5	10·9	51·7
1905–6	94·6	14·4	20·3	16·0	47·1
1904–5	105·1	10·9	21·0	17·2	42·3
1903–4	93·1	19·1	31·9	15·2	47·6
1902–3	85·1	19·2	25·7	16·6	41·6
1901–2	74·7	19·1	23·1	16·7	47·2
1900–1	71·2	23·3	18·7	22·1	55·8
1899–1900	65·0	21·6	15·2	19·8	57·7
1898–9	67·0	22·9	22·9	14·9	57·5
1897–8	66·4	20·0	20·3	15·4	55·6

The United States and Canada are the largest exporters of wheat-flour to this country, though a number of other countries participate in the trade to a small extent. During the past three years, however, less flour has been purchased abroad than was the case for many earlier years. The average price was 9*s.* 6*d.* per cwt. against 9*s.* 10½*d.* last year.

The imports of barley were less than in the preceding five years. Russian and Roumanian receipts fell off, but there was some compensation in the supplies from Turkey.

A noticeable feature in the above table, however, is the diminution in oats, of which only 10,884,000 cwts. were received against an average of about 16,000,000 cwts. in the preceding five years. The falling-off is chiefly due to smaller receipts from Russia and the United States. The average price of oats per quarter was 17*s.* 3*d.* in 1906–7 compared with 16*s.* 3*d.* in 1905–6.

Maize was imported into this country in larger quantities than has been the case since 1900–1. Russia and Roumania, which in consequence of unfavourable harvests during the past two or three years had practically ceased to contribute to the supplies, again appear in the returns, Russia furnishing 5,038,000 cwts. and Roumania 7,450,000 cwts., while 20,880,000 cwts. came from Argentina and 14,391,000 cwts from the United States. The average price of maize was nearly 5*s.* 1*d.* per cwt., or about the same figure as in the previous year.

In connection with the above it may be of interest to reproduce a table, which has been given annually in this

Journal for many years past, showing the average prices of British wheat, barley and oats per quarter, computed from the weekly averages of corn returns during each of the harvest years ending 31st August, 1898 to 1907. The quantities given in the table are the quantities returned as sold from which the averages are calculated.

Harvest Years.	Prices.			Quantities.		
	Wheat.	Barley.	Oats.	Wheat.	Barley.	Oats.
	s. d.	s. d.	s. d.	Quarters.	Quarters.	Quarters.
1897–98 ...	36 2	26 11	18 3	2,534,224	3,339,842	599,666
1898–99 ...	26 0	26 1	17 3	3,498,515	3,629,760	777,676
1899–1900 ...	26 4	25 2	17 4	3,255,654	3,355,241	722,859
1900–01 ...	27 1	25 0	18 1	2,463,341	3,109,149	684,956
1901–02 ...	28 4	25 11	20 4	2,451,275	3,176,599	698,840
1902–03 ...	26 5	23 4	17 8	2,386,017	3,151,337	1,104,660
1903–04 ...	27 2	21 10	16 4	2,129,448	2,780,473	1,132,086
1904–05 ...	30 7	24 6	17 0	1,746,927	3,141 058	1,178,154
1905–06 ...	28 9	24 2	18 5	2,940,263	3,202,613	940,015
1906–07 ...	28 1	24 5	18 4	2,830,991	3,376,615	1,219,419

In the case of wheat the price obtained for home-grown grain in 1906–7 was only slightly below that of the preceding year, while the prices of barley and oats were practically the same.

Notes on Insect, Fungus and Other Pests.*

Owing no doubt to the fact that farmers and others are at this season of the year more than usually busy, the number of specimens received during the past month is considerably less than earlier in the year. At the same time a good many inquiries have been made regarding pests of various kinds, and increased interest appears to be taken in the identification of the cause of damage done to crops.

MOTHS.—Leaves of rose, plum and privet sent from Auchterless were found to be infested by the caterpillars of a Tortrix moth. It was, however, then too late for treatment, most of the damage having been done and the caterpillars pupated. Earlier in the season, when the caterpillars were at work and therefore exposed, spraying with 1 lb. of Paris green (paste) in 250 gallons of water would have poisoned them.

* Notes on insect, fungus and other pests, dealing with the specimens submitted to the Board for identification, and their apparent prevalence, will appear in this *Journal* month by month. The notes commenced with the issue for June, 1907.

The rolled-up leaves containing the pupæ or cocoons should be pulled off where practicable and burned.

Swift Moth.—A specimen caterpillar of the common Swift moth (*Hepialus lupulinus*) was sent late in July by one correspondent, who stated that this species of caterpillar was doing great damage to dahlias and chrysanthemums grown on land which, until the past spring, was old pasture. The caterpillars of this moth are found in practically every month of the year. Caterpillars of the genus *Hepialus* are characterized by the fact that the hooks on the abdominal legs are arranged in a complete circle, instead of being found only on one edge as is typical with other caterpillars.

The caterpillars are not easily dealt with, but it may be said that the measures recommended against surface caterpillars (see Leaflet No. 33) are generally applicable in the case of Swift caterpillars.

BEETLES.—Two specimens of beetles taken from Australian blackwood in store at Woolwich have been identified as *Phacodes obscurus* and *P. personatus*, two Australian beetles belonging to the family *Cerambycidæ*, or Longicorns. The life history of these beetles resembles that of *Neoclytus caprea* (see *Journal*, July, 1907, page 215), but they live in different species of trees. The measures suggested in the case of *Neoclytus* are applicable against these beetles.

"Death-Watch" Beetle.—A beetle and grubs taken from an elm plank at Chatham were found to be specimens of *Anobium domesticum*. This is a common but small beetle which often infests furniture in houses, and the little holes in chairs and tables are frequently caused by it. The beetles bore into the wood and lay eggs, from which come grubs that make galleries in the timber. The injection of paraffin into the burrows with a fine syringe will kill the brood if it be reached. If it can conveniently be done, planks may be sunk in hot water and left for a time, both beetles and grubs being destroyed. This beetle is one of the so-called "Death-Watches," the name arising from the ticking noise the beetles make in striking the wood with their hard jaws (see also *Journal*, June, 1907, page 157).

Beetles infesting Cherry Trees.—In May and June, 1906, a correspondent at Slough submitted to the Board some speci-

mens of cherry trees the timber of which was infested with larvæ of a Lamellicorn beetle closely resembling those of *Cetonia.* Certain identification was then difficult, but the larvæ were kept, and 15 specimens of the beetle have now been bred out. It is found that the beetles are *Gnorimus nobilis*, a species which is rare in Britain, but has been taken from the rotten wood of fruit trees—amongst others the plum tree. *G. nobilis* is described by Fowler as a rare and probably disappearing species, although it may possibly become common. Thirteen specimens have lately been taken from a tree in Buckinghamshire.

FLIES.—A number of specimens of flies and their maggots attacking crops have been received.

Gall-Midge on Lime.—Injured specimens of inflorescence of lime from Kew Gardens were found to be infested by one of the Gall-Midges or *Cecidomyidæ*, the species being *Cecidomyia tiliæ.* Several galls were present, some containing larvæ and others pupæ, the larvæ not falling away when full fed, but pupating *in situ.* The adults are described as issuing in August. Petioles and young shoots are infested by the insect, the galls induced being multilocular, or many-celled.

Wheat Midge.—Specimens of wheat from King's Lynn, where much of the wheat crop is stated to be similarly affected, were infested by the Wheat Midge, *Cecidomyia* (or *Diplosis*) *tritici.* This little insect deposits its eggs in the ears of the wheat, and, owing to the feeding of the maggots, the young grains of corn fail to reach maturity. When full grown the larvæ or maggots fall to the ground and pass the pupal stage a little below the surface.

Nothing can be done against the larvæ in the ears. When any crop has been infested ploughing should be deep, in order to ensure that the pupæ are buried with the surface soil, thus preventing the adult midge reaching the surface. Another important point lies in the fact that the maggots may be harvested with the grain, and the refuse and chaff after threshing may contain many. Hundreds have been seen in such refuse heaps, which should be burnt, or the midges will duly issue in the next year and proceed to egg-laying. A few Thrips (see below) were found in conjunction with the midges.

Maggots in Mushrooms.—An inquirer sent specimens of

mushrooms from Highgate, which were infested with a dipterous maggot, not, however, the ordinary fungus-gnat maggot (see *Journal*, June, 1907, page 162). The fly will be bred out, if possible, for accurate determination. Some species of the family *Mycetophilidæ* or fungus-gnats are, on occasion, very harmful to mushrooms, while other and related species are destructive to injurious fungi, or are scavengers. Where flies are found to be numerous in a mushroom house the house should be fumigated. The flies often congregate on the glass of small windows in such houses, and spraying with paraffin will kill these and so prevent egg-laying.

Among other flies, the Carrot Fly, *Psila rosæ* (see Leaflet No. 38) was sent from Braintree; and the Cabbage Root Fly, *Phorbia brassicæ* (see Leaflet No. 122) from Earls Barton, Northampton.

APHIDES.—Specimens of various kinds have been received infested with aphides: Rose and plum from Auchterless; peach, cherry and plum from Farnborough; cherry from Claygate, Surrey; Woolly Aphis on apple from Hayle, Cornwall; and Larch Aphis from Whixley, Yorks., and several other localities. Aphides are described in Leaflets No. 34 (Woolly Aphis), No. 88 (Hop Aphis), No. 68 (Currant Aphides), No. 104 (Aphides or Plant Lice).

In connection with the specimens of Cherry Aphis from Farnborough, it may be said that as this aphis produces much honey-dew, quassia should be used in conjunction with soft soap, though not if the fruit is maturing. The correspondent mentioned the fact that some of the branches of the cherry trees were overweighted with leaves. This may possibly be due to an excessive application of manure early in the season. It is recommended by a grower who has made a practical study of the subject that liquid manure should be applied while the fruit is swelling, viz., ½ lb. sulphate of ammonia and ½ lb. sulphate of potash to 40 gallons of water.

Aphis on Ash.—From Basingstoke the Board received a specimen of ash infested with an aphis which, judging from the appearance of the specimen and from the ball or nest-like formation of the leaves attacked, was probably *Pemphigus nidificus*, Low. There appears to be only one mention of this aphis in the literature on the subject, and this refers to Germany.

It was impossible, therefore, to obtain specimens for comparison. Through the courtesy of Mr. C. O. Waterhouse and Mr. W. F. Kirby, of the British Museum, the Board have been informed that the Natural History Department of the British Museum possesses similar specimens, which are labelled *Pemphigus fraxini*, possibly a synonym for the so-called *P. nidificus*. In Buxton's *British Aphides* there is no mention whatever of a *Pemphigus* on the ash.

THRIPS IN WHEAT.—Specimens of wheat infested by thrips (*Thrips cerealium*) were sent from Horsham and Worcester, while a few occurred in the specimens of midge-infested wheat from King's Lynn. The thrips insect is exceedingly small, and, living in the ears of corn, sucks away the sap, so causing the grain to shrivel. Unfortunately, it is impossible to combat it when in the ear. As, however, the pest hibernates among the stubble, &c., deep ploughing should take place as a preventive measure. By such means the insects are deeply buried and are unable to reach the surface.

Among other pests submitted to the Board were beech infested with the Felted Beech Coccus (see Leaflet No. 140), sent from Much Hadham, Herts.; Currant Mite from Farnborough (see Leaflet No. 1); and Pear Leaf Blister Mite, *Eriophyes pyri*, Sch., from Preston.

FUNGI.—A number of plants infested with fungus diseases have been received during the past month, and short notes on a few of these are given below.

"Straw Blight" in Wheat.—From Linton, Cambs., the Board received a sample of wheat of which a great deal in the neighbourhood of Linton was said to be "going off just after the grain is about three parts developed" This wheat was attacked by the fungus *Ophiobolus graminis*, Sacc., which causes disease of wheat in Europe and Australia. The disease is known by several names, among which may be mentioned "Foot Rot" and "Straw Blight" of Europe, and "Take All" of Australia. The fungus lives in the soil and attacks the roots of wheat and other gramineous plants.

An article on the subject appeared in the *Journal of the Royal Agricultural Society* so long ago as 1872, and a note on this fungus also appeared in the Board's *Journal* for June, 1904, p. 154. It has been found in New South Wales that *O. graminis* is most

prevalent in wet seasons, and this has been observed elsewhere. Mr. Carruthers, for example, in his 1872 report for the Royal Agricultural Society remarked that "its appearance has always been associated with long-continued rains. The appearance of the disease in England during the past year (1871) was no doubt due to the very damp early summer." The disease did some damage to wheat in Germany in 1894, while it is recorded as occurring in France.

The measures which have been employed for checking the disease have not been entirely successful. In Europe manuring the soil and subsequent rolling have proved beneficial. In New South Wales more effective results are obtained by the use of a fungicide, such as sulphate of iron, applied at the rate of 70 lb. per acre in spring.

A long rotation is of the utmost importance with diseases of this kind; by depriving the fungus of the wheat plant, its normal food, it should be possible to starve it out of the soil. Oats are said to be immune to "Foot Rot."

Diseased Oats.—A correspondent sent from Enfield, co. Meath, specimens of diseased oats, which were said (1) to turn brown in the leaf; (2) to cease growing, the grain becoming very weak and almost dead. These oats were found to be attacked by the fungus *Helminthosporium teres*, Erikss. As spraying is impracticable in the case of cereals, preventive measures should be adopted. The spores will perish if cereals are kept off the land for three years, unless supported by wild grasses on banks, hedges, &c., which should, therefore, be kept closely trimmed. It would not be advisable to use the grain grown in an infected field for seed. If, however, for any reason it is desired to use such grain for seed, it should be sprinkled with a 1 per cent. solution of formalin in water, and thoroughly mixed so that all the grain comes in contact with the solution. Nitrate of potash at the rate of 2 cwt. per acre might be used if signs of the disease appear in the crop.

"*White Rust*" *on Salsify.*—Specimens of salsify were received attacked by "White Rust," *Cystopus tragopogonis*, Schröt, a near relation to the white rust (*C. candidus*) on crucifers. The fungus grows on various weeds belonging to the *Compositæ*, more especially on goatsbeard, and may pass from some such weed to the cultivated crop. An account

of the white rust of crucifers will be found in Leaflet No. 163 (*White Rust of Cabbages*).

Apple-tree Mildew.—Specimens of apple from Canterbury were found to be affected with Apple-tree Mildew, *Sphaerotheca mali*, Magnus, a disease which is dealt with on p. 358.

Disease on Gooseberries.—Diseased gooseberry plants submitted by a Teignmouth correspondent were attacked by the fungus *Pseudopeziza ribis*, Klebahn. It is now too late in the season to derive any benefit from spraying, but if all leaves are burned or buried the disease will probably not recur next year.

Mildew on Euonymus.—A correspondent submitted specimens of mildewed *Euonymus Japonicus*, L., from Lewisham, the foliage of which was found to be infested by the parasitic fungus *Oidium Euonymi-japonicæ*, Sacc. This pest is, so far as is at present known, confined to euonymus. The infested shrubs should be dredged with flowers of sulphur when the leaves are damp, and a second time if the sulphur is washed off by rain. The treatment should be repeated early in the spring. All diseased leaves should be collected and burned.

Rose Mildew.—Rose leaves sent from Claygate, Surrey, were found to be attacked by Rose Mildew, *Sphaerotheca pannosa*, Lév. This mildew will not pass to fruit trees. Diseased trees should be sprayed with a solution of sulphide of potassium (liver of sulphur), 1 oz. in 2 gallons of water. In spring, just when the leaves are expanding the trees should be dredged with flowers of sulphur.

Rose Rust.—Other specimens of rose forwarded from Eastbourne were infected with the Rose Rust caused by the fungus *Phragmidium subcorticatum*, Winter. The summer fruit of the fungus is represented by myriads of orange-coloured powder-like spores. About the end of August the yellow patches give place to black spots which are composed of tufts of minute resting-spores. The latter remain dormant during the winter and germinate in the following spring.

The reappearance of the disease the following year is therefore entirely dependent on the presence of resting-spores in the neighbourhood, and the utmost care should, therefore, be taken to collect and burn all fallen leaves in autumn. It should also be noted that the fungus attacks wild roses; if

any such in the immediate neighbourhood are infected they should be removed. In spring it would be wise to syringe plants that have been previously attacked with a solution of 2 oz. of sulphate of copper (bluestone) in 3 gallons of water. This should be done before the buds expand, care being taken to wet every part of the plant. The soil about the plants may, with advantage, be sprayed with the same solution. Spraying with dilute Bordeaux mixture will check the disease in its early stage, but efforts should be concentrated on preventive measures.

Other Specimens.—A number of other specimens infested with fungi or otherwise damaged included: Onions infested with *Sclerotinia bulborum*, Wak. (Leaflet No. 127), from Stoke-under-Ham, Somerset; potatoes infested with the potato disease, *Phytophthora infestans* (Leaflet No. 23), from Welshpool and Bristol; potatoes attacked by Black Scab, *Oedomyces leproides*, Trabut (Leaflet No 105), from Stockport; gooseberry bushes affected with European Gooseberry Mildew, *Microsphaera grossulariæ*, Lév. (Leaflet No. 52), from Norwich and Ross-on-Wye; gooseberry bushes infected with American Gooseberry Mildew, *Sphaerotheca mors-uvae*, (Leaflet No. 195), from the borders of Warwickshire, about eight miles from Evesham; peach affected with Peach Leaf Curl (Leaflet No. 120), from Farnborough; and apple twigs showing Brown Rot, *Sclerotinia fructigena*, Pers. (Leaflet No. 86), from Preston. From Preston also came pear twigs which were killed by excess of wet and cold, no parasitic fungus being present. Finally, specimens of *Gesneria zebrina* were injured by what is known as "scorch," caused by the direct rays of the sun falling on the leaves when damp. This trouble in glasshouses is often easily obviated by better ventilation, especially early in the day.

Apple-tree Mildew.

This disease, (*Sphaerotheca mali*, Magnus), a close ally of the hop mildew, gooseberry mildew, and rose mildew, is very prevalent, and is one of those pests likely to accompany apple trees to every part of the globe, as the mycelium is said to tide over the winter in the bark or between the bud scales, and thus escape detection.

The winter or ascigerous form of fruit is everywhere rare, and in this country has only once been found in very small quantity in an orchard at Mortlake. This form of fruit is certainly too local in its occurrence to account for the universal distribution of the mildew in the spring, which consequently

APPLE-TREE MILDEW.

must originate either from the conidia or summer form of fruit, which would imply the power on their part of germinating the year following their production, or from hibernating mycelium. For the former of these two alternatives there is no precedent.

As a rule the fungus completely checks the growth of the branches, consequently all the leaves that under normal conditions would have been scattered at intervals on a long shoot, are crowded into a rosette at the end of a branch of

the previous season. Such leaves are stunted in growth, and covered with a dense white powder, consisting of the summer form of fruit of the fungus.

When the fungus is present in less quantity in the spring, the growth of the shoot is not checked, and the scattered leaves bear a small amount of mildew only.

This disease is much more prevalent on old or full-grown trees than on nursery stock, and when present on the latter rarely arrests the growth of the branches.

Preventive Measures.—When the disease is present in its worst form, the only certain method of arresting its progress is to cut off and burn all the infected rosettes of leaves. The cut should be made about 2 in. behind the tuft of leaves. Trees that have been treated in this manner throw out healthy branches and remain free from the disease. When the disease appears in a mild form on the scattered leaves, the tree should be sprayed with a solution of sulphide of potassium (liver of sulphur), 1 oz. dissolved in two gallons of water.

Infection of the leaves only takes place when they are quite young, consequently this is the time to look for the mildew, and on the first symptoms of its appearance, commence spraying. If this opportunity is neglected and the mildew be allowed a start, spraying may be considered useless.

It would under all circumstances be advisable to spray trees where the disease had previously existed, commencing when the leaf-buds are expanding.

No definite proof is as yet forthcoming as to whether insects assist in distributing the spores of the fungus, or aiding in its attack in any other way. However, it is quite certain that mildew is most abundant on trees that are infested with "woolly scale" and "green fly," consequently these pests should be dealt with. (See Leaflets 34 and 104.)

Live Stock Import Regulations.—United States.

New regulations* for the inspection and quarantine of animals imported into the United States were issued on the 4th April, 1907. The following information indicates the requirements as regards animals exported from this country:—

* The previous Regulations (now superseded) are given in the *Journal*, Vol. X., p. 114, June, 1903.

Horses.—Horses are required at the port of entry to pass a veterinary inspection by an inspector of the Bureau of Animal Industry. If he finds that the animals are affected with any contagious disease he isolates them and immediately reports the fact to the Chief of the Bureau of Animal Industry who may refuse to allow the landing of horses so diseased.

Certificates for Ruminants.—Ruminants must be accompanied by a certificate from the local authority of the district in which the animals have been continuously located for the six months preceding the date of shipment, stating that no contagious pleuro-pneumonia, foot-and-mouth disease, anthrax, rinderpest, or any other disease contagious to cattle, except tuberculosis and actinomycosis, has existed in said district for one year preceding.

Certificate for Swine.—Swine must be accompanied by a certificate similar to the one required for cattle, sheep, and other ruminants, but relating to the existence of foot-and-mouth disease, hog cholera, swine plague, and erysipelas.

Affidavit for Ruminants and Swine.—Ruminants and swine must be accompanied by an affidavit by the owner stating that the animals have been continuously located in the district whence shipped during the six months preceding the date of shipment; that no contagious disease affecting the species of animals imported has existed among them or among any animals of the kind with which they have come in contact during the previous six months, and that no inoculation has been practised among the animals during the preceding year; also by an affidavit from the importer or his agent supervising the shipment stating that they have not passed through any district infected with contagious diseases affecting the said kind of animals; that they have not been exposed in any possible manner to the contagion of any of the said contagious diseases, and that the animals, when not driven, have been shipped in clean and disinfected cars and vessels direct from the farm where purchased.

Presentation of Papers to Collector of Customs.—The certificates and affidavits must accompany the animals and be presented to the collector of customs at the port of entry.

Period of Quarantine.—Cattle imported from Great Britain, Ireland, and the Channel Islands shall be subject to a

quarantine of sixty days, counting from the date of shipment, this date of shipment to be the date of clearance of the vessel bringing the animals to the United States. Sheep and other ruminants and swine shall be subject to a quarantine of fifteen days, counting from the date of arrival at the quarantine station. Cattle and sheep imported for immediate slaughter at the port of landing may be imported without quarantine, subject to such restrictions as the Chief of the Bureau of Animal Industry, after causing an inspection to be made, may consider necessary in each case for guarding the domestic animals of the United States from contagion.

Tuberculin Test for Cattle.—All cattle six months old or over imported from Great Britain, Ireland, and the Channel Islands, directly into the United States, which are subject to quarantine, shall be tested with tuberculin by an inspector of the Bureau of Animal Industry before being exported or after arrival at the animal quarantine station at the port of entry; and, when considered necessary, a subsequent tuberculin test of imported cattle shall be made during the last two weeks of their quarantine period. All cattle so tested which show a reaction shall be prohibited from entry into the United States or disposed of as provided in these regulations. Persons desiring animals tested abroad should address the inspector of the United States Bureau of Animal Industry, care of United States Consul's Office, Liverpool, England.

Permits for Imported Animals.—Any person contemplating the importation of cattle, sheep, and other ruminants, and swine must first obtain two permits from the Secretary of Agriculture; one stating the number and kind of animals to be imported, the port, and the probable date of shipment, which will, on presentation to the American Consul at the port of shipment, entitle them to clearance; the other stating the port at which the animals are to be landed and quarantined and the approximate date of their arrival. This will assure the reception of the number and kind of animals specified therein at the port and quarantine station on the date prescribed for their arrival or at any time during three weeks immediately following, after which the permit will be void. These permits will in no case be available at any port other than the one mentioned therein. Permits must be in the

name of the owner of, or agent for, any one lot of animals. Permits will be issued to quarantine at such port as the importer may elect, so far as facilities exist at such port, but in no case will permits for importation at any port be granted in excess of the accommodation of the Government quarantine station at such port.

Papers by United States Consuls.—United States Consuls have instructions to give clearance papers or certificates for animals from their districts intended for exportation to the United States only upon presentation of permits as provided above, with the dates of the probable arrival and destination corresponding with the permits, and in no case for a number in excess of that mentioned therein. When such shipments originate in the interior of the country these permits should be submitted to the Consul of the district and through the forwarding agent to the Consul at the port of embarkation.

Inspection.—All animals imported into the United States, which are subject to inspection will be carefully inspected by an inspector of the Bureau of Animal Industry, and all animals found to be free from disease and not to have been exposed to any contagious disease will be admitted, subject to the regulations relating to quarantine, except as otherwise provided.

Quarantine Release.—A release from quarantine will be given to each owner for the number and kind of animals belonging to him which are discharged from quarantine, and this release will be a certificate of fulfilment of quarantine regulations. In case an importation of animals is owned by more than one person a release will be issued to each owner or agent covering the animals which belong to him.

Disposal of Diseased Animals.—Whenever any animal on arrival at the port of entry or in the quarantine station is found to be affected with a contagious disease or to have been exposed to such disease, the animal and all other animals that have been in contact with or exposed to the affected animal shall be placed in special quarantine. All animals so quarantined either on arrival at the port of entry or after reaching the quarantine station shall be at once reported by the inspector to the Chief of the Bureau of Animal Industry, who will direct whether or not the animals quarantined shall

be appraised and slaughtered as provided by section 8 of the Act of the 30th August, 1890.

*Importation of Pure-bred Animals for Breeding Purposes.**—Importers of animals which are subject to both inspection and quarantine, imported for breeding purposes and intended to be entered free of duty under the provisions of the Tariff Act of the 24th July, 1897, will not be required to give the bond or stipulation for the production of registry certificates provided for by the customs regulations, until the end of the quarantine period, in order that they may avail themselves of such period to transfer the registration of imported animals from the foreign to the affiliated American books of registry. Such animals will not, however, be released from quarantine except upon notice from the collector of customs that all requirements of the customs regulations relative to their entry have been complied with by the importer.

Animals in Bond.—Animals in bond to Canada, entering and passing through United States territory, will be subject to inspection at the port of entry, or at any point *en route*, by an inspector of the Bureau of Animal Industry, and if found diseased or to have been exposed to the contagion of disease, shall be dealt with as the Secretary of Agriculture may direct, depending upon the nature of the disease as provided by the regulations †

Exportation of Meat Products to Argentina.

According to an Argentine Decree dated 4th October, 1906, and coming into force on 1st January, 1907, all pig and other imported animal products are required to be inspected previous to their introduction being allowed into Argentina. This inspection is intended to secure

---

* See *Journal*, September, 1906. Vol. XIII, No. 6, p. 365.

† Live-stock import regulations have been published in this *Journal* for the following countries:—United States, Sept., 1906; Argentina, Jan., 1905, April, 1905, Oct., 1905, and June, 1906; New South Wales, April, 1905; Germany, May, 1905; New Zealand, June, 1905; South Australia, July, 1905; France, Aug., 1905; Belgium, Sept., 1905; Uruguay, Oct., 1905; Victoria, Nov., 1905; Spain, Dec., 1905; Queensland, Jan., 1906; Western Australia, Feb., 1906; Tasmania, March, 1906; Transvaal, June, 1906; Ceylon, Cape Colony, Sept., 1906; Holland, Malta, Oct., 1906; Natal, Austria-Hungary, Nov., 1906; Russia, Hungary, Dec., 1906; Iceland, Italy, India, Feb., 1907; Isle of Man (sheep), Ireland, March, 1907; Canada, Isle of Man (swine), Jamaica, April, 1907; Norway, Sweden, Isle of Man (sheep), July, 1907.

that the articles are not made from animals suffering from contagious diseases, and are in a sound condition for public consumption. All products of animal origin must be accompanied by a certificate (duly legalised by an Argentine Consul) of the country where they were manufactured, to the effect that the preparation proceeds from a factory, that is subject to a sanitary supervision similar to that in force in Argentine Republic.

The regulations for the sanitary supervision of factories in Argentina require that all industrial establishments elaborating pig or other animal products for exportation must send out their articles with a stamp which shows that they have been technically examined, the stamp to be affixed in the manner prescribed by the regulations of the Veterinary Department. They must also bear a trade mark so as to determine exactly the place of manufacture. In addition to this a certificate must be produced proving that the establishment where the article is manufactured has undergone sanitary inspection.

The conditions of British law and administration with respect to the wholesomeness of meat and meat products differ, however, from those contemplated in the Argentine Decree. In the United Kingdom responsibility for the wholesomeness of the meat and meat products offered for sale rests primarily on the vendors, who are liable to prosecution for any infringement of the law. The requisite sanitary supervision for the detection of any such infringement is exercised by local sanitary authorities through their Medical Officers of Health and other Officers, and the certification of official inspection of individual carcases or of individual meat preparations forms no part of the British system of sanitary control.

Representations to this effect were accordingly made by the Foreign Office to the Argentine Government, and as a result the full operation of the Decree was deferred until some arrangement should be made which would comply with the new requirement. The Local Government Board, after consultation with the Board of Agriculture and the Board of Trade, have now formulated the following conditions under which meat products may be accompanied by an official certificate, and these conditions have been accepted by the Argentine Government.

Traders in England and Wales who prepare or pack meat foods for export to Argentina and who desire that such exportations should be accompanied by an official attestation of precautions taken to safeguard the wholesomeness of the foods in question should apply to the Local Government Board for the approval of an officer to act as certifying officer, and must undertake to give all necessary facilities to this officer as regards access, inspection, sampling, &c. The certifying officer is required to keep himself informed by personal inquiry and in other ways as to the structure, &c., of the premises where the meat is prepared, the cleanliness and wholesomeness of the methods employed, the wholesomeness of the meat, &c., and the certificate issued states that the exporting establishment is under the prescribed sanitary supervision.

The importation of hams treated with boracic acid previous to packing is forbidden by the Argentine Republic.

International Dairy Congress.

An International Dairy Congress will be held at The Hague from the 16th to the 20th September, 1907. It will consider subjects which are of common interest to dairy countries and more particularly questions which refer to legislation relating to the prevention of butter adulteration. A large number of delegates are expected to attend and influential committees have been formed in Austria, Belgium, France, Holland, Hungary, Italy, Luxemburg, Norway, Russia, Sweden, Switzerland, and the United Kingdom. Sir Edward Strachey, M.P. ; Dr. T. E. Thorpe, F.R.S., Principal of the Government Laboratory ; Mr. E. G. Haygarth Brown and Mr. A. E. Balleine, of the Board of Agriculture and Fisheries, have been appointed as the official representatives of this country. The British Committee, which consists of over thirty members, has held meetings during the past summer, and sub-committees have been formed to consider the subjects which will be discussed in the three sections of the Congress. Mr. G. E. Lloyd-Baker, Hardwicke Court, Gloucester, is the Chairman of the Committee and Mr. E. C. Trepplin, Orchard Portman, near Taunton, is the Hon. Secretary.

A report * on the preceding Congress, which was held in Paris

* Report on the Second International Dairy Congress [Cd. 3689.] Price *6d.*

in 1905, has been recently issued by the Board of Agriculture and Fisheries. It has been prepared by Mr. A. E. Balleine, who was the official British delegate at that Congress. The volume contains a historical account of the movement relating to international co-operation in matters relating to the dairy industry and the formation of the International Dairy Federation. The text of all the resolutions adopted at the second Congress is given, with a detailed account of the proceedings which referred to the prevention of butter adulteration including, in particular, the following subjects:—The unification of analytical methods, the denaturation of margarine, and legislation. The systems of earmarking and of butter control are fully explained and the arguments for or against their adoption are summarised. The publication of the report has been delayed in order to incorporate recent information for the use of English members of the Third Congress, and the volume contains a chronological account of the proposals which have been made for international co-operation for the prevention of butter adulteration. Particulars are given of several forms of co-operation which are actually in existence for this purpose between certain countries, and of various international organisations which refer to the prevention of food adulteration in general. In connection with certain proposals relating to restricted importation and control of butter, the report contains an interesting account of analogies which exist in certain countries regarding other kinds of produce. A summary is given of the various standards which have been fixed for butter, as regards water and butter-fat, and of the legislation relating to the earmarking of margarine, &c., which has been adopted in several countries. An appendix to the report contains a bibliography of colonial and foreign dairy laws, indicating where details may be obtained in English official publications. A translation of the extensive Danish and Dutch dairy legislation is also given with detailed information relating to the systems of butter control which exist in Holland and in the Argentine Republic. The volume contains statistical tables regarding the proportion and composition of Dutch controlled butter and detailed figures relating to the countries from which butter is imported into this country, as well as those to which it is exported.

Chicken Coops.

One of the most important factors in the successful rearing of chickens is the coop, and chick-raising is greatly facilitated by the provision of suitable coops for the young birds and their mothers. The number of people who have adopted the colony plan of rearing is increasing every year, but the number of coops which fulfil every essential of what a really good coop ought to be is small in comparison with the number of those which are either totally unfit for chick-rearing or defective in one respect or another.

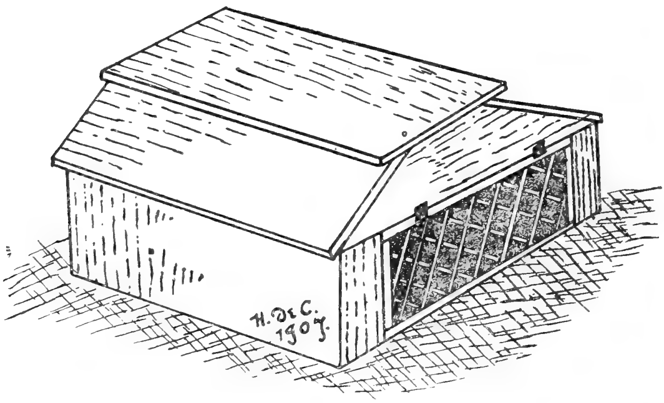


FIG. 1.

The essential points of a good coop are (1) it must be lightly but strongly made, so that whilst it is portable the frequent changing from place to place may not shake it to pieces; (2) it must be proof against prowling vermin and birds of prey, as chicks are always subject to their attacks; (3) the coop must afford the hen and her brood protection against storm and rain, but at the same time it must not shut out the air, of which they require a liberal supply; (4) it must be roomy enough to accommodate the brood not only by night, but also during the daytime when the weather is unfit for running in the fields. I have prepared a few sketches of coops which have been found suitable for chicks at various stages of their lives and in varying conditions of the weather.

The coops and runs are made of light durable wood and wire netting, and their construction can be seen from the illustrations, so that only a brief description of the various figures will be required. The coop shown in Fig. 1 is the only one which has not a run either permanently or temporarily attached, but

of course a run similar to that shown in Fig. 2 could be utilised with the coop in Fig. 1. This coop keeps the chicks entirely confined and is only suitable as a night coop, if left without a run

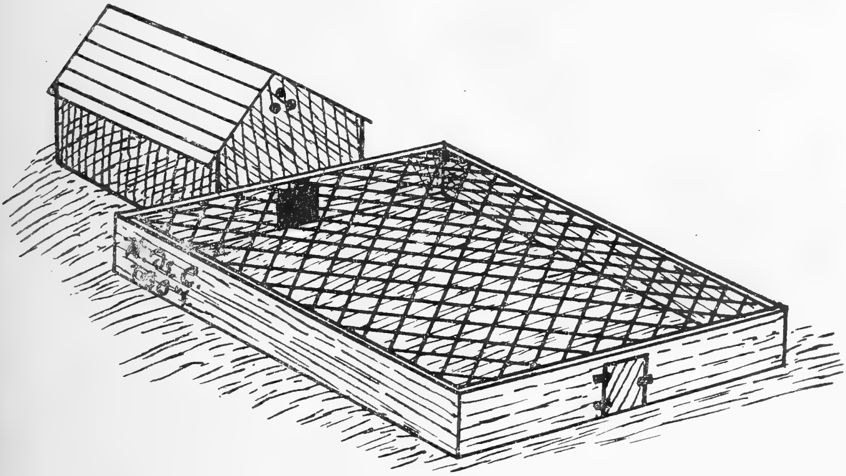


FIG. 2.

as shown. It is a perfectly safe coop if fitted with a floor or laid upon hard, level ground and might be used to accommodate at night either young chicks or those which have been weaned. Fig. 2 shows a style of coop and detachable run which is often seen. The coop is plainly made, with a sloping span roof, and has an opening to the run. The notable feature of the run is

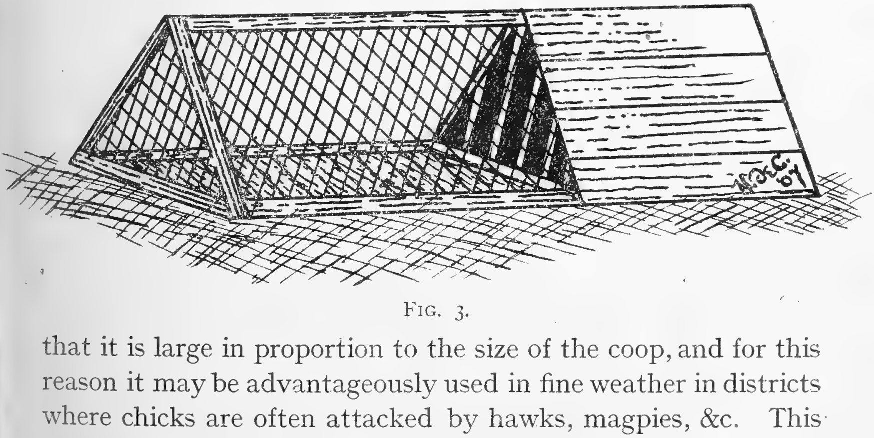


FIG. 3.

that it is large in proportion to the size of the coop, and for this reason it may be advantageously used in fine weather in districts where chicks are often attacked by hawks, magpies, &c. This is not a good style of run for early rearing, when the weather is severe, nor in the heat of summer unless it can be placed under the shade of a tree or in some such favourable situation.

It is a drawback that it does not protect the chicks against either rain or sun, but in a shaded or sheltered place this run has advantages over runs which are covered by boards overhead.

The same remarks apply to the coop and run in Fig. 3. It is an airy appliance and proof against vermin, but the run does not shade or shelter the chicks. This coop has the recommendation that it is inexpensive, and it is largely used both with and without a run for rearing chickens and young pheasants in fields where there is plenty of cover. A more expensive style of coop is shown in Fig. 4. Here the run as well as the coop or sleeping compartment is covered by boards, a decided advantage in bleak or unshaded localities. This coop can be used in the fields in all kinds of weathers, except of course when there is severe frost or snow on the ground,

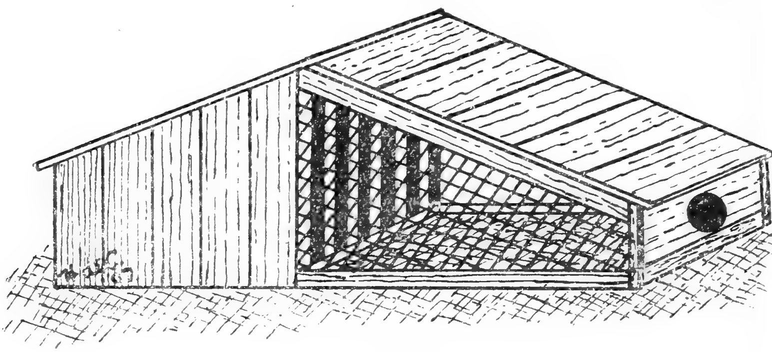


FIG. 4.

and whilst the chicks are always under cover they get ample air through the netting at the sides, light and sunshine being also freely admitted. The mother hen is supposed to be shut within the coop and the chicks can pass between the bars from coop to run. A double coop and run is sometimes useful, and this can be made of two coops, one at each end, with the run in the middle. The run may be used without a partition for two broods of chicks, the respective hens being enclosed in the coops at the end, and all the chicks can take food and exercise together and will return to the proper coops. But if the chicks are of different ages, it is advisable that a partition should be placed in the middle of the run. This will be found an excellent appliance for rearing where space is limited, and the coops cannot be moved every day, but for field rearing the smaller single coops with detachable runs are preferable.

H. DE COURCY.

The Board of Agriculture and Fisheries propose, at the expiration of forty days from the 8th August, 1907, to make the following rule under the Fertilisers and Feeding Stuffs Act, 1906, to come into operation on 1st January, 1908 :—

Regulation under the Fertilisers and Feeding Stuffs Act.

Regulation as to the Analyst to whom Samples are to be sent.—Where under the Fertilisers and Feeding Stuffs Act, 1906, any person desires that a sample shall be analysed by the agricultural analyst, the sample, or parts of the sample, as the case may be, shall be sent to such agricultural analyst as is hereby prescribed, that is to say :—

(1) If the sample is taken in a county, or in a county borough or a burgh of which the council have appointed or concurred in appointing an agricultural analyst, then to the analyst appointed for the county or borough or burgh ;

(2) If the sample is taken in a county borough of which the council have not appointed or concurred in appointing an agricultural analyst, then to the analyst appointed for the county in which for the purposes of the Local Government Act, 1888, the borough is deemed to be situated ; and

(3) If the sample is taken in a burgh of which the council have not appointed or concurred in appointing an agricultural analyst, then to the analyst appointed for the county within which the burgh is situated or with which it has the longest common boundary.

In view of the occurrence of two cases of American Gooseberry Mildew (*Sphærotheca mors-uvæ*) in Warwickshire, the Board have passed an Order under the Destructive Insects and Pests Acts, 1877 and 1907, to come into operation on the 16th September, 1907, prescribing measures for dealing with this disease in Warwickshire. This Order is very similar in form to the Orders already in force (see *Journal*, August, 1907, p. 300), but provides for the immediate spraying, prior to destruction, of all diseased bushes which have not shed their leaves, and of all bushes in contact with diseased bushes, with a solution of liver of sulphur, containing not less than 1 oz. of liver of sulphur to two gallons of water, or with some other approved fungicide.

American Gooseberry Mildew in Warwickshire.

The general summary of the Reports of the Crop Estimators of the Board issued on the 23rd August is as follows :—

Report on Crop Prospects, August, 1907.

A spell of warm dry weather in the latter half of July had a favourable effect on the crops, and the ungenial weather during August does not appear to have prevented some general improvement as compared with the previous report relating to mid-July. The boisterous weather of the present month has knocked the crops about a good deal, and its further continuance is viewed by all the Board's Crop Estimators with great anxiety, particularly in upland districts, where the want of sun threatens to prevent the crops from ripening. The prospect has not been improved since the date of these reports.

All three cereals show some improvement during the month. Wheat, at the date of the reports, promised practically an average yield in Great Britain as a whole ; it is most promising in the East of Scotland. Barley is not quite so good as wheat. Oats are the best of the cereals, being particularly promising in the West and South-West. Reports as to beans vary, but some localities anticipate good crops. All the corn crops have abundance of straw, and they have everywhere been more or less laid by the windy rains in August, and the harvest in consequence is likely to be tedious and troublesome. The date of the corn-harvest will be generally much later than usual.

Potatoes are quite the worst crop of the year, and have further deteriorated during the month, owing to the widepread appearance of disease. The crop in Scotland appears to be healthier than in England, but the yield will be poor in both cases.

Roots have improved considerably during the month ; they are better in England than in Scotland. Reports of the difficulty of cleaning the root land are numerous, but there has been comparatively little Turnip-Fly or Finger-and-Toe.

Hay, as regards bulk, is the crop of the year, but the quality is generally very poor. That which was secured during the ten days's hot spell of July is nearly all in good condition, the South-West being particularly fortunate in this respect. Reports as to quality from Scotland are mostly better than in England, but the quantity there is not so satisfactory. Much hay is still out and uncut, and is deteriorating through wet.

Apples and pears are everywhere a short crop ; plums are very abundant in England ; and bush fruits have generally done well.

Reports from the hop counties are variable and the prospects seem somewhat uncertain. On the whole the South-Eastern Districts appear to promise little short of an average yield, and the outlook in the Western Districts is favourable.

The supply of labour seems, with few exceptions, to be sufficient or plentiful.

Summarising the reports, and representing the prospect of an average yield in each case by 100, the appearance of the crops in mid-August may be represented, for Great Britain as a whole, by the following percentages :—wheat, 100 ; barley, 99 ; oats, 103 ; potatoes, 96 ; roots, 103 ; hay, 107.

The changeable weather which marked the latter part of July continued into August, aud in the week ending August 3, it was unsettled over the whole Kingdom.

Notes on the Weather and the Crops in August.

Temperature was below the normal in all districts, and bright sunshine was also below the average. Rainfall was "heavy" in the Midland Counties and "moderate" elsewhere.

In the *second* week the general state of the weather was again unsettled, but rain was heavier and much more frequent in the north and west than in the east and south. Temperature exceeded the normal over all the Midland and Eastern counties of England, but was rather below it elsewhere. Bright sunshine was rather deficient in many parts. Rainfall exceeded the average in England N.W., Scotland N. and W., and just about equalled it in Scotland E. In the other districts except England S.W. there was a considerable deficit.

In the *third* week the weather still continued very unsettled, with daily falls of rain in the west and north and frequent rain elsewhere, so that the rainfall exceeded the average in all districts. Warmth, however, was returned as moderate in all districts except the N. and E. of Scotland. Sunshine was below the average.

The *fourth* week was upon the whole drier, but the sky was usually more or less cloudy and the atmosphere continued cool. Rain was again more frequent in the north and north-west than elsewhere, but the actual falls were not, as a rule, at all heavy.

In the *fifth* week, ending 31st August, the improvement noticeable in the previous week continued; the weather was finer, the sky being less cloudy and rain slight and infrequent, except in the extreme north and north-west. Temperature was slightly above the average in England E., S. and S.W., elsewhere it was below it. Bright sunshine, however, exceeded the average except in England S.W.

From Berkshire, it is reported that apples are unsatisfactory and will not yield more than half a crop. Plums, on the other hand, are wonderfully plentiful and free from blight. Potatoes are much affected by the cold damp weather and are said to be diseased. Roots are doing well. Experienced farmers say they cannot remember the country being so full of grass and keep. Corn crops reported to be excellent. From Lancashire it is reported that instances of potato disease are very common. A good deal of hay has been damaged by rain, and a few farmers had some out at the end of the month. Harvesting commenced about the 19th August, but was proceeding very slowly.

From Argyllshire, heavy hay crops that cannot be got in are reported. Potatoes lifting well in quantity, no disease, but rather wet in quality. Turnips promising. Grass good and oats fair in straw and beginning to turn colour.

Notes on Crop Prospects Abroad.

World's Wheat Crop.—According to an estimate, which appeared in *Dornbusch's List* (30th August, 1907), the wheat crop of the world for 1907 is put at 393,350,000 qrs. (by measure), as against 435,880,000 qrs. in 1906, 425,560,000 qrs. in 1905 and 395,185,000 qrs. in 1904. The estimate of the Hungarian Minister of Agriculture appeared on 31st August, and gives the wheat crop at 859,860,000 metric centners (395,000,000 qrs. of 480 lb.), as against 938,480,000 metric centners last year (431,114,000 qrs.). The deficit of wheat in the importing countries is put at 167,400,000 metric centners (76,899,000) as compared with a surplus in exporting countries of 160,100,000 metric centners (73,546,000 qrs.).

France.—According to an official report published in the *Journal Officiel*, 8th August, 1907, the reports on the condition of the winter wheat crop on 1st July showed it to be "good" in 40 departments, "fairly good" in 43, and "passable" in 1. Spring wheat was "good" in 20 departments, "fairly good" in 22, and "passable" in 2. According to unofficial reports it is anticipated that the wheat harvest will exceed that of last year.

Germany.—The official report on the crops in the middle of August states that the estimated yields of the winter grain crops are not unfavourable generally. The average condition is as follows:—Winter wheat, 2·9; spring wheat, 2·3; winter and spring rye, 2·6; spring barley and oats, 2·3; potatoes, 2·6 (1 = very good, 2 = good, 3 = average or medium, 4 = small, and 5 = very small). The condition of winter wheat, spring rye, barley and potatoes is not quite so good as was shown in last month's report. Spring wheat has improved slightly, and the prospects for the spring crops is generally stated to be very favourable. Potatoes are suffering from disease in many instances, in consequence of the wet, cold weather; in Baden and Alsace-Lorraine on the other hand the growth has been injured by drought. Only in Bavaria and Wurtemberg are they doing well generally, and promise to yield a good crop.

Hungary.—According to the official report of the Ministry of Agriculture in the middle of August the probable yields of the crops were likely to be somewhat higher than the previous estimates. The yield of wheat, however, is estimated at only about two-thirds of that of last year, and barley, rye and oats are all expected to produce less than in 1906. Maize, however, promises a higher yield.

Austria.—The official report on the crops in the middle of August shows that a good crop of wheat is expected, and the other crops are also satisfactory.

Roumania.—According to an official report up to the end of July, transmitted through the Foreign Office, the yield of cereals varies greatly. It is smallest in parts of the plains, where little more than the seed will be recovered, whilst in Moldavia and districts where there has been more rain, a satisfactory, and in some localities even a good harvest will be reaped. Barley and oats will give a better crop than wheat and rye. Everywhere the quality of cereals is good. The estimate of the wheat harvest given in last month's Journal is only 5,500,000 qrs., against an average of 8,940,000 qrs. during the past five years.

Bulgaria.—According to *Dornbusch* (26th August), the wheat crop of Bulgaria is estimated at about half the size of last year's yield, but the quality is excellent in every respect.

Russia.—According to the Trade and Industry Gazette of 15th August, the prospects of the cereal crops are considered to be above the average. The harvest of winter wheat, however, is generally below, but spring wheat appears to be quite up to the average.

Canada.—The acreage sown with wheat in Manitoba in 1907 is officially estimated at 2,790,000 acres, against 2,722,000 acres in 1906. In Saskatchewan the area is put at 1,958,000 acres, against 2,117,000 acres in 1906. The crop prospects at the end of August were regarded as uncertain. In Alberta, the official estimate of the wheat yield is 5,640,000 bushels, against 3,234,000 bushels last year. According to *Dornbusch* (23rd August), the Government estimates the wheat crop in the West at 95,000,000 bushels, against last year's production of 100,000,000 bushels, and of 85,000,000 bushels in the previous year.

Miscellaneous Notes.

Yellow Rattle or Rattle Grass.—A correspondent has sent from Willingdon, Sussex, specimens of a weed which was over-running certain land on chalk under down grass. This weed proved to be Yellow Rattle (*Rhinanthus Crista-galli*, Linn.), locally named "Rattle grass." The weed is partially parasitic on grasses and various herbs, and may become obnoxious when it appears in great quantity. Mowing the plant early before it ripens its seeds is probably the best means of getting rid of it. This treatment should be followed for two years at least, and has been found entirely satisfactory. Top-dressings of salt at the rate of 5 to 7 cwt. per acre have in some cases proved very effective, while close depasturing with sheep tends to reduce it, although it is not liked by stock in either the dry or the fresh state. When the plant affects damp ground, as in damp meadows and pastures, draining would be a useful measure. The application of 7 cwt. per acre of basic slag before the end of November, combined with close pasturing with stock is also likely to have a good effect in repressing the growth of *R. Crista-galli.* On strong land the use of basic slag results in luxuriant development of clover, and such pasture is closely eaten down by stock. The consequence is that Yellow Rattle and most other weeds are prevented attaining normal growth and seeding, and therefore soon disappear. It must be emphasised that the basic slag and grazing must be combined, and the slag will only have an influence on the parasite when the field is grazed, not mown.

Wild Onion.—Specimens of the Wild Onion or Crow Garlic (*Allium vineale*), have more than once been submitted to the Board for identification. This weed, which usually occurs in patches and not regularly over the infested field, may, as shown by experiments conducted at the Woburn Experiment Station, be destroyed or

largely reduced by spraying or watering the plants with a 5 per cent. solution of pure carbolic acid in water. Fuller information on the subject will be found in the Journal of the Royal Agricultural Society of England, for the years 1900, 1901 and 1902.

Ensilage.—In connection with the making of silage stacks, some account of which is given in the Board's Leaflet No. 9 (*Ensilage*), it may be pointed out that success in making silage depends upon attention to certain important factors. (1) The entrance of much air into the stack must be prevented, this being accomplished by means of heavy pressure. Soil is one of the most convenient materials for weighting. (2) As little surface as possible should be exposed to the air, and as the greater the diameter of the stack the less the waste, the diameter should not be less than 16 to 18 feet. (3) The cost of building the stack must be kept as low as possible. The higher the stack the more expensive it is to "weight," but the height may be as great as is found convenient. Silage stacks should have the same diameter all the way up, and the top should be flat, or nearly so, in order that the weighting material may lie safely on it.

Failure of Walnut Crop.—Several instances of the failure of the walnut crop have been brought to the notice of the Board, and the Director of Kew Gardens states that the failure of walnuts this year is rather wide-spread, and is due to the ovules not having been fertilised. This defect is not improbably due to the pollen having been almost continuously damp and therefore not dispersed by wind.

Dyers' Greenweed.—Specimens of a leguminous plant, which was causing much loss in the Malvern district, were identified as the Dyers' Greenweed (*Genista tinctoria*). When growing in pastures it spreads very rapidly, and stock appear absolutely to refuse to touch it. Unfortunately the only known means of eradication consists in ploughing it up.

Short Docking of Sheep.—The attention of the Board has been directed to certain cases in which the docking of sheep has been carried to excess, the tails having been removed practically back to the spine. The "dock" being in such cases unprotected, the sheep are very liable to be attacked by the Sheep Maggot Fly (see Leaflet No. 126). It can hardly be claimed that this extreme short docking improves the appearance of the sheep; it would rather appear on the contrary to render them unsightly, and some dealers recognize this by paying less money for them. It is understood that many sheep-breeding societies have done their best to dissuade owners from the practice of short docking, and the Board entirely concur in the view that it is unnecessary, and may be the cause of needless suffering.

Agricultural Statistics, 1906.—The third part of the Agricultural Statistics for 1906 (Cd. 3653, price 8½d), which has now been issued by the Board of Agriculture and Fisheries, comprises detailed information of prices of agricultural products, supplies of live stock at markets, and imports and exports of agricultural commodities. It contains an introductory report by Mr. R. H. Rew, in which the principal changes in prices and imports are discussed and illustrated by a number of diagrams.

Export of Cheese from Denmark.—In the Report of the British Consul at Copenhagen (Annual Series, No. 3862), it is mentioned that in the course of the last few years cheese has attained some importance as an article of export; in 1903, the export to the United Kingdom was about 1,000 cwts.; in 1905, the quantity increased to about 2,600 cwts.; and in 1906 to about 8,700 cwts. The prices that can be obtained in the United Kingdom are very profitable, but there are still difficulties as regards producing a uniform quality. A weekly quotation of cheese by the Chamber of Commerce at Copenhagen is contemplated on the same principle as the butter quotation.

Admission of Grain Residues and Agricultural Machinery to Costa Rica.—According to a Decree dated 10th July, 1907, grain residues used as cattle food, and agricultural machinery and implements are declared free of all fiscal duties, including "wharfage."

SELECTED CONTENTS OF CURRENT PERIODICALS.

Bulletin of the British Ornithologists' Club. Vol. xx.
Report on the Immigration of Summer Residents in the Spring of 1906.

Bristol Naturalists' Society's Proceedings. Fourth Series, Vol. i., Part iii.
The Effect of Electricity upon Plants, *J. H. Priestley.*

The Journal of the South-Eastern Agricultural College, Wye. 16.
An Experiment on the Effect of Foodstuffs on the Production of Milk, *V. S. Rawson and W. R. Tucker;* Report on Economic Zoology, 1906–7, *F. V. Theobald;* Fifth Report from the Analytical Laboratory, *H. E. Annett, F. V. Darbishire and E. J. Russell;* Soil Analyses, *A. Amos and E. J. Russell;* Notes on Recent Work, *S. T. Parkinson;* Report on Economic Mycology, 1906–7 (including a Report on The American Gooseberry Mildew), *E. S. Salmon;* Hop Experiments, *A. Amos;* A List of Plants Poisonous to Stock, *S. T. Parkinson and E. J. Russell:* Veterinary Notes, *T. W. Cave.*

Bulletin Mensuel de l'Office de Renseignements Agricoles. 16. 7.
Rapport sur le Fonctionnement des Caisses Mutuelles Agricoles; Rapport sur le Fonctionnement des Caisses de Crédit Agricole Mutuel et les résultats obtenus en 1906; La Vaccination Anti-tuberculeuse, *M. S. Arloing;* Le Classement de l'Orge de Brasserie au point de vue Technique et Agricole, ayant spécialement égard à son contenu d'Azote, *M. Hubert;* Importance des pertes d'Azote Nitrique à l'air dans certains Engrais Complexes, *M. Astruc.*

Zeitschrift für Pflanzenkrankheiten. xvii. 3.
Kulturversuche mit Rostpilzen, *H. Klebahn;* Ein Beitrag zur Entwickelungsgeschichte, sowie zur Ermittelung der Infektionsbedingungen und der besten Bekämpfungsart, von *Gloeosporium Ribis* (*Lib.*), Mont. et Desm. (*Pseudopeziza Ribis* Klebahn), *Dr. Ewert.*

Zeitschrift für Forst- und Jagdwesen. xxxix. 8.
Kritische Vergleichung der wichtigsten forsttechnischen und forstpolitischen Massnahmen deutscher und ausserdeutscher Forstverwaltungen, *Dr. Martin.*

Landwirtschaftliche Jahrbücher. xxxvi. 4.
Sechster Bericht über die Versuchswirtschaft Lauchstadt der Landwirtschaftskammer für die Provinz Sachsen, 1904–6, *Dr. W. Schneidewind.*

Bulletin de l'Agriculture (Belgium). xxiii. 7.
Les Marbrures du beurre, *L. Marcas & C. Huyge.*

Transvaal Agricultural Journal. v. 20.
Agricultural Progress in the Transvaal; Agriculture in America:—Dairying; Horse Breeding in South Africa from an industrial point of view; New Zealand Flax.

Agricultural Gazette of New South Wales. xviii. 7.
Resumé of the Regulations under the Vegetation Diseases Act—In the States of the Commonwealth of Australia, New Zealand and South Africa, *E. D. Butler.*

ADDITIONS TO THE LIBRARY.

Africa—

Destruction of Locusts.—Correspondence relative to the measures taken to secure co-operation between the South African Governments. (39 pp.) Pretoria, 1907.

Cape of Good Hope.—Reports of the Chief Veterinary Surgeon and Assistant Veterinary Surgeons for 1906. (30 pp.) Cape Town, 1907.

Australasia—

Western Australia.—Department of Agriculture. Bull. 20. The Diseases of Animals and Meat Inspection. (13 pp.) Perth, 1907.

Cleland, Dr. J. B.—Demonstrations on some Parasites of the Blood. (8 pp.) Perth, 1906.

Canada—

Ontario.—Bureau of Industries, Report, 1905. (192 pp.) Toronto, 1906.

France—

Seltensperger, Ch.—Le Livre Agricole des Instituteurs. (5 parts of approximately 100 pp. each.) Paris: Baillière et Fils, 1907. 5 francs the complete volume.

Heckel, Dr. E.—Sur les Origines de la Pomme de Terre cultivée. (82 pp.) Marseille: Barlatier, 1907.

Germany—

Rau, Gustav.—Die Not der deutschen Pferdezucht. (256 pp.) Stuttgart: Schickhardt & Ebner, 1907. M. 4·80.

Dünkelberg, Dr. F. W.—Der Wiesenbau in seinen landwirtschaftlichen und technischen Grundzügen. (374 pp. + iv diagrams.) Braunschweig: Bieweg, 1901.

Great Britain—

Kelsall, Rev. J. E. and Munn, P. W.—The Birds of Hampshire and the Isle of Wight. (371 pp.) London: Witherby, 1905. 15s. net.

Woburn Experimental Station.—Report on Field and Pot-Culture Experiments, 1905–6. (31 pp.) London: John Murray, 1907. 1s.

Herdmann, Prof. W. A.—Address delivered at the Anniversary Meeting of the Linnean Society of London, May, 1907. (18 pp.) London.

University of Leeds.—Researches into some of the Chemical Changes involved in Hard Cheese Production. (23 pp.) Leeds, 1907.

Collinge, W. E.—Injurious Insects and other Animals observed in the Midland Counties, Report, 1906. (44 pp.) Birmingham: Cornish Bros., 1907. 2s. 6d.

Haines, C. R.—Notes on the Birds of Rutland. (175 pp.) London: R. H. Porter, 1907. 7s. 6d. net.

South Eastern Agricultural College, Wye.—Report on Economic Zoology, 1906–7. (152 pp.) London: Headley Bros., 1907. 2s. 6d.

Shorthorn Society of Great Britain and Ireland.—Coates's Herd Book. Vol. 53, Part I, Bulls, from 93958 to 97758. (488 pp.) London: The Secretary to the Society, 1906. Price (to Non-Members) 21s.

Holmes, E. M.—The Japanese Seaweed Industry [Museum Report for 1905–6 of the Pharmaceutical Society of Great Britain (pp. 51–68)], 1907.

Cowan, T. W.—The British Bee-Keeper's Guide Book. 19th edition. (226 pp.) London: "British Bee Journal" Office, 1907. 1s. 6d.

India—

Bengal.—Department of Land Records and Agriculture. Notes on Agave and Furcræa in India. (195 pp.) Calcutta: Secretarial Book Depôt. 1s. 6d.

Department of Agriculture of India, Memoirs:—

Chemical Series. Vol. I, No. 3. The Pot-Culture House at the Agricultural Research Institute, Pusa. (39–44 pp. and 10 plates.)

Entomological Series. Vol. I, No. 2. The more important Insects injurious to Indian Agriculture. (113–252 pp.) Calcutta: Thacker, Spink & Co., 1907.

United States—

Roberts, I. P.—The Farmstead. (350 pp.) New York: Macmillan, 1905. 4s. 6d. net.

Hunt, T. F.—The Forage and Fiber Crops in America. (413 pp.) New York: Orange Judd Company, 1907.

Wiley, H. W.—Foods and their Adulteration. (625 pp.) London: J. & A. Churchill, 1907. 21s. net.

Maynard, S. T.—Successful Fruit Culture. (274 pp.) 1906. *Thomas, J. J.*—The American Fruit Culturist. 21st Edition. (823 pp.) 1906. *Waugh, F. A.*—Fruit Harvesting, Storing, Marketing. (224 pp.) 1906; Dwarf Fruit Trees. (124 pp.) 1906; Systematic Pomology. (288 pp.) 1903; Plums and Plum

Culture. (371 pp.) *Fuller, A. S.*—The Nut Culturist. (289 pp.) 1906. *Taft, L. R.*—Greenhouse Construction. (210 pp.) 1906; Greenhouse Management. (382 pp.) 1906. *Herrington, A.*—The Chrysanthemum. (160 pp.) 1906. *Rexford, E. E.*—Home Floriculture. (300 pp.) 1906. *Allen, C. L.*—Bulbs and Tuberous-Rooted Plants. (311 pp.) 1905. *Fiske, G. B.*—Prize Gardening. (307 pp.) 1901. *Waugh, F. A.*—Landscape Gardening. (152 pp.) 1906. New York: Orange Judd Company.

Collins, T. Byard.—The New Agriculture. (374 pp.) 1906. New York: Munn & Company.

U.S. Department of Agriculture.—Report No. 84. Progress of the Beet Sugar Industry in the United States in 1906. (135 pp.)

Bureau of Animal Industry:—

Circ. 107.—Capons and Caponizing. (10 pp.) Circ. 111.—Sanitary Relations of the Milk Supply. (7 pp.)

Bull. 96.—A Comparative Study of Tubercle Bacilli from varied sources. (88 pp.) Bull. 100.—The Germicidal Value of Liquor Cresolis Compositus (U.S.P.). (24 pp.) Washington, 1907.

Bureau of Entomology:—

Circ. 84.—The Grasshopper Problem and Alfalfa Culture. (10 pp.) Circ. 87.—The Colorado Potato Beetle. (15 pp.) Circ. 90.—The White-Pine Weevil. (8 pp.)

Bull. 68.—Part I. The Pear Thrips. (16 pp.) Bull. 69.—The Chinch Bug. (95 pp.) Bull. 70.—Report of the Meeting of Inspector of Apiaries. (79 pp.) Washington, 1907.

Office of Experiment Station:—

Bull. 182.—Proceedings of the Annual Meeting of the American Association of Farmers' Institute Workers, Nov. 1906. (88 pp.) Bull. 183.—Mechanical Tests of Pumps and Pumping Plants. (72 pp.) Bull. 185.—Iron in Food and Its Functions in Nutrition. (80 pp.) Bull. 186.—Exercises in Elementary Agriculture. Plant Production (64 pp.) Bull. 187.—Studies on the Digestibility and Nutritive Values of Legumes. (55 pp.) Washington, 1907.

Farmers' Bulletins:—

No. 287.—Poultry Management. (48 pp.) No. 291.—Evaporation of Apples. (38 pp.) No. 292.—Cost of Filling Silos. (15 pp.) No. 293.—Use of Fruit as Food. (38 pp.) No. 294.—Farm Practice in the Columbia Basin Uplands. (30 pp.) No. 295.—Potatoes and Other Root Crops as Food. (45 pp.) No. 296.—Experiment Station Work—XLI. (32 pp.) No. 297.—Method of Destroying Rats. (8 pp.) No. 299.—Diversified Farming under the Plantation System. (14 pp.) No. 300.—Some Important Grasses and Forage Plants for the Gulf Coast Region. (15 pp.) No. 301.—Home-Grown Tea. (16 pp.) Washington, 1907.

Forest Service.—The Use of the National Forests. (42 pp.) Washington, 1907.

Bureau of Plant Industry.—Bull. 98.—Soy Bean Varieties. (28 pp. + v plates.) Bull. 103.—Dry Farming in the Great Basin. (43 pp.) Bull. 104.—The Use of Feldspathic Rocks as Fertilizers. (32 pp.) Washington, 1907.

Bureau of Soils:—

Bull. 36.—Further Studies on the Properties of Unproductive Soils. (71 pp.)

Bull. 40.—Some Factors influencing Soil Fertility. (40 pp.)

Bull. 41.—Action of Water and Aqueous Solutions upon Soil Phosphates. (58 pp.)

Bull. 43.—Reclamation of Alkali Land in Salt Lake Valley, Utah. (28 pp.)

Bull. 44.—Reclamation of Alkali Soils at Billings, Montana. (21 pp.)

Contributions from the United States National Herbarium. Vol. X, Part 4. The Leguminosæ of Porto Rico. (133–220 pp.) Washington, 1907.

[Books may be borrowed from the Board's Library on certain conditions, which may be ascertained on application.]

PRICES OF AGRICULTURAL PRODUCE.

AVERAGE PRICES of LIVE STOCK in ENGLAND and SCOTLAND in the Month of August, 1907.

(*Compiled from Reports received from the Board's Market Reporters.*)

Description.	England. First Quality.	England. Second Quality.	Scotland. First Quality.	Scotland. Second Quality.
FAT STOCK :—	per stone.*	per stone.*	per cwt.†	per cwt.†
Cattle.:—	s. d.	s. d.	s. d.	s. d.
Polled Scots	7 10	7 7	39 2	35 9
Herefords	8 2	7 7	—	—
Shorthorns	7 11	7 3	37 9	34 11
Devons	8 4	6 11	—	—
	per lb.*	per lb.*	per lb.*	per lb.*
	d.	d.	d.	d.
Veal Calves	$7\frac{3}{4}$	7	$8\frac{1}{4}$	$6\frac{1}{2}$
Sheep :—				
Downs	9	$8\frac{1}{4}$	—	—
Longwools	$8\frac{1}{2}$	$7\frac{3}{4}$	—	—
Cheviots	$9\frac{1}{4}$	$8\frac{3}{4}$	$9\frac{1}{4}$	$8\frac{1}{4}$
Blackfaced	$8\frac{1}{2}$	$8\frac{1}{4}$	$8\frac{1}{2}$	8
Cross-breds	9	$8\frac{1}{4}$	$9\frac{1}{4}$	$8\frac{1}{2}$
	per stone.*	per stone.*	per stone.*	per stone.*
Pigs :—	s. d.	s. d.	s. d.	s. d.
Bacon Pigs	6 10	6 4	6 3	5 7
Porkers	7 2	6 9	6 8	6 0
LEAN STOCK :—	per head.	per head.	per head.	per head.
Milking Cows :—	£ s.	£ s.	£ s.	£ s.
Shorthorns—In Milk	20 8	17 7	21 15	17 13
,, —Calvers	20 0	17 6	19 6	16 15
Other Breeds—In Milk ..	20 17	14 19	19 4	15 9
,, —Calvers ...	14 5	13 2	18 14	15 5
Calves for Rearing	2 2	1 13	2 5	1 12
Store Cattle :—				
Shorthorns—Yearlings ...	9 15	8 4	10 1	7 17
,, —Two-year-olds ...	13 19	12 4	14 17	12 7
,, —Three-year-olds	17 7	15 1	16 10	14 14
Polled Scots—Two-year-olds	—	—	15 16	14 2
Herefords— ,,	15 3	13 19	—	—
Devons— ,,	13 6	12 0	—	—
Store Sheep :—	s. d.	s. d.	s. d.	s. d.
Hoggs, Hoggets, Tegs, and Lambs—				
Downs or Longwools ...	38 6	33 7	—	—
Scotch Cross-breds	—	—	30 5	24 11
Store Pigs ;—				
Under 4 months	27 7	20 5	19 9	17 3

* Estimated carcase weight.

† Live weight.

AVERAGE PRICES of DEAD MEAT at certain MARKETS in ENGLAND and SCOTLAND in the Month of August, 1907.

(Compiled from Reports received from the Board's Market Reporters.)

Description.	Quality.	London.	Birmingham.	Manchester.	Liverpool.	Glasgow.	Edinburgh.
		per cwt. s. d.	per cwt. s. d.	per cwt. s. d.	per cwt. s. d.	per cwt. s. d.	per cwt. s. d.
BEEF :—							
English	1st	52 6	52 6	52 6	—	58 6*	56 0*
	2nd	50 6	48 0	47 6	—	56 0*	47 0*
Cow and Bull ...	1st	42 0	46 0	45 6	44 6	46 6	42 6
	2nd	28 0	41 0	39 6	37 0	39 0	36 6
U.S.A. and Canadian :—							
Port Killed ...	1st	53 0	52 0	51 6	52 0	52 6	51 6
	2nd	49 0	48 0	47 0	47 0	48 0	44 6
Argentine Frozen—							
Hind Quarters ...	1st	36 0	38 0	37 6	37 6	39 0	38 0
Fore ,, ...	1st	26 6	28 0	27 6	26 0	30 0	29 0
Argentine Chilled—							
Hind Quarters ...	1st	44 6	45 0	42 0	41 0	42 6	—
Fore ,, ...	1st	30 0	31 0	32 6	31 6	30 6	—
American Chilled—							
Hind Quarters ...	1st	56 6	56 0	56 0	56 0	54 0	56 6
Fore ,, ...	1st	35 6	36 0	35 0	35 0	36 0	37 6
VEAL :—							
British	1st	59 6	60 6	61 0	68 6	—	—
	2nd	53 0	48 6	56 0	62 6	—	—
Foreign	1st	62 6	—	56 0	—	—	60 6
MUTTON :—							
Scotch	1st	75 6	—	73 0	74 0	75 6	70 0
	2nd	71 0	—	67 6	69 0	62 0	56 6
English	1st	70 6	70 0	70 0	68 6	—	—
	2nd	64 6	56 0	64 6	64 6	—	—
U.S.A. and Canadian—							
Port killed ...	1st	—	60 6	—	—	—	—
Argentine Frozen ...	1st	31 0	32 6	32 6	32 0	32 0	31 6
Australian ,, ...	1st	30 6	30 6	30 6	30 0	32 0	—
New Zealand ,, ...	1st	42 0	37 6	—	41 6	32 0	—
LAMB :—							
British	1st	78 6	70 6	73 6	73 0	76 0	74 0
	2nd	70 0	65 6	66 6	68 0	67 0	64 0
New Zealand ..	1st	51 6	53 0	51 6	51 6	50 6	54 0
Australian	1st	47 6	49 6	51 0	50 0	44 6	—
Argentine	1st	—	47 0	46 6	46 6	43 6	44 6
PORK :—							
British	1st	58 6	61 0	56 6	56 0	59 0	52 6
	2nd	52 0	52 6	53 6	52 6	57 0	45 0
Foreign	1st	56 0	56 0	56 0	56 0	—	—

* Scotch.

AVERAGE PRICES of **British Corn** per Quarter of 8 Imperial Bushels, computed from the Returns received under the Corn Returns Act, 1882, in each Week in 1905, 1906 and 1907.

Weeks ended (*in* 1907).	Wheat.						Barley.						Oats.					
	1905.		1906.		1907.		1905.		1906.		1907.		1905.		1906.		1907.	
	s.	*d.*	*s.*	*d.*	*s.*	*d.*	*s.*	*d.*	*s.*	*d.*	*s.*	*d.*	*s.*	*d.*	*s.*	*d.*	*s.*	*d.*
Jan. 5 ...	30	4	28	4	26	0	24	4	24	6	23	11	16	3	18	2	17	3
,, 12 ...	30	4	28	6	26	1	24	6	24	8	24	2	16	3	18	4	17	4
,, 19 ...	30	5	28	5	26	1	25	0	24	11	24	1	16	5	18	4	17	5
,, 26 ...	30	6	28	7	26	2	25	1	25	1	24	5	16	7	18	7	17	5
Feb. 2 ...	30	6	28	10	26	3	25	0	25	1	24	4	16	7	18	10	17	5
,, 9 ...	30	7	28	10	26	6	25	2	25	3	24	5	16	8	18	10	17	7
,, 16 ...	30	5	28	11	26	7	25	2	25	6	24	1	16	9	19	0	17	7
,, 23 ...	30	10	28	10	26	10	25	0	25	4	24	2	16	10	19	0	17	9
Mar. 2 ...	30	8	28	8	26	9	25	2	25	0	24	2	16	10	19	0	17	9
,, 9 ...	30	9	28	5	26	8	25	2	25	1	23	11	16	10	18	8	17	11
,, 16 ...	30	10	28	5	26	10	24	11	24	8	24	2	16	10	18	10	18	0
,, 23 ...	30	9	28	4	26	10	25	2	24	4	24	0	17	0	18	8	18	1
,, 30 ...	30	9	28	3	26	8	25	1	24	5	23	9	16	11	18	11	18	2
Apl. 6 ...	30	9	28	7	26	9	25	6	24	2	24	3	17	0	18	11	18	3
,, 13 ...	30	8	28	11	26	8	24	3	24	4	23	9	17	6	19	4	18	6
,, 20 ...	30	8	29	4	26	8	24	4	24	0	23	3	17	5	19	1	18	7
,, 27 ...	30	9	29	6	26	10	24	4	24	0	23	3	17	9	19	6	18	9
May 4 ...	30	8	29	10	27	0	25	3	23	10	23	6	18	0	19	9	19	3
,, 11 ...	30	8	30	1	27	6	24	10	24	1	24	0	18	3	20	0	19	7
,, 18 ...	30	10	30	3	28	4	24	8	23	10	23	10	18	5	20	1	20	1
,, 25 ...	30	11	30	4	29	7	24	4	24	2	24	3	18	8	20	2	20	5
June 1 ...	31	3	30	4	31	4	23	6	22	10	24	0	19	1	20	5	20	8
,, 8 ...	31	4	30	3	32	0	24	0	23	4	24	7	18	11	19	11	20	7
,, 15 ...	31	7	30	4	31	10	26	0	23	6	24	7	19	1	20	2	20	11
,, 22 ...	31	7	30	5	31	4	23	9	22	10	24	11	18	10	20	2	20	9
,, 29 ...	31	8	30	3	31	2	23	2	24	3	24	6	19	7	20	1	20	8
July 6 ...	32	1	30	2	31	3	22	11	23	0	24	8	19	6	20	2	20	11
,, 13 ...	32	3	30	5	32	0	23	10	23	8	24	10	19	7	20	4	20	11
,, 20 ...	32	2	30	3	32	6	23	7	23	2	24	6	18	11	20	5	21	1
,, 27 ...	32	3	30	5	32	11	23	11	22	4	27	3	19	3	20	2	20	8
Aug. 3 ...	31	11	30	9	33	2	22	0	22	1	26	4	18	4	19	3	21	2
,, 10 ...	30	5	30	5	33	5	22	5	23	0	26	6	16	11	17	11	21	3
,, 17 ...	28	5	29	0	33	6	23	4	24	2	25	9	16	4	17	0	20	4
,, 24 ...	27	1	27	9	33	7	23	6	25	0	25	0	15	9	16	10	19	8
,, 31 ...	26	11	26	9	33	10	23	5	24	3	24	6	15	9	16	6	18	11
Sept. 7 ...	27	1	26	4	31	11	23	4	24	9	24	2	15	11	16	3	17	7
,, 14 ...	26	11	25	11			23	7	24	3			16	0	16	1		
,, 21 ...	26	8	25	9			23	10	24	3			15	11	16	0		
,, 28 ...	26	9	25	9			24	3	24	8			16	1	16	2		
Oct. 5 ...	26	9	26	1			24	9	25	0			16	3	16	3		
,, 12 ...	26	11	26	3			24	10	25	3			16	6	16	7		
,, 19 ...	27	1	26	6			25	0	24	10			16	7	16	8		
,, 26 ...	27	4	26	7			24	11	24	10			16	8	16	10		
Nov. 2 ...	27	10	26	7			24	9	24	8			17	1	16	11		
,, 9 ...	28	3	26	6			24	10	24	8			17	4	17	1		
,, 16 ...	28	7	26	4			24	6	24	4			17	8	17	2		
,, 23 ...	28	5	26	3			24	6	24	1			17	9	17	3		
,, 30 ...	28	8	26	1			24	6	24	1			17	11	17	2		
Dec. 7 ...	28	6	26	1			24	7	24	1			17	11	17	4		
,, 14 ...	28	5	26	1			24	5	23	11			17	11	17	3		
,, 21 ...	28	4	26	3			24	6	24	3			17	11	17	3		
,, 28 ...	28	3	26	0			24	7	24	1			18	1	17	3		

AVERAGE PRICES of **Wheat**, **Barley**, and **Oats** per Imperial Quarter in FRANCE, BELGIUM, and GERMANY, and at PARIS, BERLIN, and BRESLAU.

—		Wheat. 1906.	Wheat. 1907.	Barley. 1906.	Barley. 1907.	Oats. 1906.	Oats. 1907.
		s. d.	*s. d.*	*s. d.*	*s. d.*	*s. d.*	*s. d.*
France:	July ...	40 0	44 0	25 4	26 3	23 5	22 9
	August ...	39 7	42 7	25 1	25 9	23 2	21 2
Paris:	July ...	40 7	46 6	26 7	27 9	24 7	22 6
	August ...	39 11	43 9	25 10	26 11	24 4	21 7
Belgium:	June ...	29 9	33 6	24 2	26 6	22 4	23 9
	July ...	29 8	35 4	23 11	25 5	22 7	24 0
Germany:	July ...	39 7	46 3	25 5	31 3	24 8	27 11
	August ...	38 1	46 1	26 4	28 3	21 9	25 10
Berlin:	June ...	39 10	44 10	—	—	23 8	27 9
	July ...	39 8	45 7	—	—	22 10	27 3
Breslau:	June ...	36 10	44 4	27 0 (brewing) 24 7 (other)	29 7 (brewing) 27 0 (other)	23 3	25 8
	July ...	37 4	45 6	27 3 (brewing) 26 3 (other)	29 7 (brewing) 27 0 (other)	23 9	25 1

NOTE.—The prices of grain in France have been compiled from the official weekly averages published in the *Journal d'Agriculture Pratique*; the Belgian quotations are the official monthly averages published in the *Moniteur Belge*; the German quotations are taken from the *Deutscher Reichsanzeiger*, the prices for the German Empire representing the average of the prices at a number of markets.

AVERAGE PRICES of **British Wheat, Barley,** and **Oats** at certain Markets during the Month of August, 1906 and 1907.

—	Wheat. 1906.	Wheat. 1907.	Barley. 1906.	Barley. 1907.	Oats. 1906.	Oats. 1907.
	s. d.	*s. d.*	*s. d.*	*s. d.*	*s. d.*	*s. d.*
London...	30 0	33 1	28 2	26 11	17 10	20 5
Norwich	29 7	32 11	20 5	26 1	17 6	19 11
Peterborough	28 9	33 0	24 6	24 11	17 0	20 4
Lincoln...	29 1	34 1	20 11	—	17 11	20 8
Doncaster	28 11	33 8	—	—	19 2	21 11
Salisbury	30 6	32 4	21 11	23 3	18 3	19 9

AVERAGE PRICES of PROVISIONS, POTATOES, and HAY at certain MARKETS in ENGLAND and SCOTLAND in the Month of August, 1907.

(*Compiled from Reports received from the Board's Market Reporters.*)

Description.	London.		Bristol.		Liverpool.		Glasgow.	
	First Quality.	Second Quality.	First Quality.	Second Quality.	First Quality.	Second Quality.	First Quality.	Second Quality.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
BUTTER :—	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.
British ...	12 6	11 0	12 0	11 0	—	—	14 0	—
	per cwt.	per cwt.	per cwt.	per cwt.	per cwt.	per cwt.	per cwt.	per cwt.
Irish Creamery	105 6	103 0	107 6	105 6	105 0	102 0	106 6	—
,, Factory	94 0	88 6	93 0	86 0	95 0	87 6	—	—
Danish ...	113 6	111 6	—	—	114 0	111 0	114 0	—
Russian ...	97 6	93 0	96 0	84 0	92 0	84 0	96 0	86 0
Australian ...	97 6	95 6	96 0	88 0	—	—	—	—
New Zealand	103 0	101 0	104 0	102 0	—	—	—	—
CHEESE :—								
British—								
Cheddar ...	86 6	81 0	82 0	72 0	72 0	68 0	60 6	57 0
					120 lb.	120 lb.		
Cheshire ...	—	—	—	—	64 0	59 0	—	—
					per cwt.	per cwt.		
Canadian ...	57 6	56 6	56 6	54 0	56 6	53 6	57 0	54 6
BACON :—								
Irish	69 6	65 0	—	—	70 0	66 0	71 0	68 6
Canadian ...	62 6	59 0	64 0	58 6	62 0	57 0	63 0	58 6
HAMS :—								
Cumberland ...	100 0	94 0	—	—	—	—	—	—
Irish	99 0	93 0	—	—	—	—	104 0	94 0
American (long cut) ...	61 6	58 6	62 0	58 6	61 0	56 6	61 6	58 0
EGGS :—	per 120.	per 120.	per 120.	per 120.	per 120.	per 120.	per 120.	per 120.
British ...	11 8	9 9	10 2	—	—	—	—	—
Irish	10 3	9 2	9 7	8 10	9 7	8 7	9 11	8 6
Danish ...	9 11	9 1	—	—	10 0	9 4	9 7	8 10
POTATOES :—	per ton.	per ton.	per ton.	per ton.	per ton.	per ton.	per ton.	per ton.
Duke of York	71 6	65 0	91 6	63 6	78 6	70 0	—	—
Snowdrop ...	75 0	68 6	93 6	73 6	98 6	85 0	—	—
Up-to-Date ...	65 0	58 6	—	—	71 6	—	—	—
HAY :—								
Clover ...	99 6	89 0	83 6	73 6	99 6	75 0	69 0	64 0
Meadow ..	90 6	80 6	81 6	71 6	—	—	69 6	64 6

DISEASES OF ANIMALS ACTS, 1894 to 1903.

NUMBER of OUTBREAKS, and of ANIMALS Attacked or Slaughtered.

GREAT BRITAIN.

(From the Returns of the Board of Agriculture and Fisheries.)

DISEASE.	AUGUST.		8 MONTHS ENDED AUGUST.	
	1907.	1906.	1907.	1906.
Swine-Fever :—				
Outbreaks	264	75	1,823	787
Swine Slaughtered as diseased or exposed to infection ...	1,265	481	8,495	4,420
Anthrax :—				
Outbreaks	80	63	753	620
Animals attacked ...	114	75	1,003	908
Glanders (including Farcy) :—				
Outbreaks	87	101	622	763
Animals attacked	162	177	1,436	1,425
Sheep-Scab :—				
Outbreaks	10	8	416	300

IRELAND.

(From the Returns of the Department of Agriculture and Technical Instruction for Ireland.)

DISEASE.	AUGUST.		8 MONTHS ENDED AUGUST.	
	1907.	1906.	1907.	1906.
Swine-Fever :—				
Outbreaks	25	16	109	77
Swine Slaughtered as diseased or exposed to infection ...	335	137	1,670	852
Anthrax :—				
Outbreaks	—	—	1	3
Animals attacked	—	—	3	7
Glanders (including Farcy) :—				
Outbreaks	1	2	4	6
Animals attacked	1	3	8	14
Sheep-Scab :—				
Outbreaks	5	12	190	161

(4,000 9 | 07—H & S 2061)

THE JOURNAL

OF THE

BOARD OF AGRICULTURE.

Vol. XIV. No. 7.

OCTOBER, 1907.

DEGENERATION IN POTATOES.

During the past few years many inquiries have been addressed to the Royal Botanic Gardens, Kew, as to the reason why potato tubers fail to form sprouts at the proper season, even when placed under the most favourable conditions for doing so. Last spring one correspondent stated that out of 70 tons of potatoes of high grade, specially intended for "seed," only 5 tons showed signs of sprouting, the remainder being disposed of, at a serious loss, for culinary purposes. This condition of things is not confined to this country. In Germany* serious losses have been sustained owing to the sterility of potato "sets," more especially of the kind known as Magnum Bonum. Very few of the eyes produced sprouts, and the "sets" at the time of lifting were not shrivelled and dried up as is the case under normal conditions, but on the other hand were solid and quite firm and in many cases had actually increased in size. In one instance where the "sets" were graded by a machine before planting, an increase in size of from one-half to three-quarters had taken place. This proves that the "sets" after planting had commenced growth a second season, and had accumulated the starch formed by the scanty amount of foliage produced. The new tubers formed by such plants were small and few in number. In many instances sprouts were not formed, and the "sets" remained intact in the soil throughout the season. The loss on the potato crop varied from about 5 per cent. to total loss,

*_Deutsche Landwirtsch. Presse_, Nos. 91, 94, 95, and 97, 1905. See _Journal_, Feb., 1906, Vol. xii, p. 671.

and averaged from 50 to 60 per cent. Investigations made by Dr. Schleh and Dr. Speikermann proved the absence of any specific disease, and the failure was in part attributed to the practice of growing the same kind of potato from sets produced on the spot for a long period of time.

In France Dr. Delacroix* has described the occurrence, on a large scale, of a similar sterility of potato tubers, which he calls "filosité." In this case the few sprouts produced become considerably elongated, remain very slender, and usually do not appear above ground, and when they do so, produce only a few small stunted leaves. Here again there was an absence of disease, and the author considers that "filosité" is due to decadence and loss of vitality, brought about by the employment of the vegetative method of reproduction invariably followed. In those countries where attention is paid to the production of improved varieties of potatoes, certain points have been constantly kept in view. Amongst such may be enumerated: increase of crop; improved flavour; smooth and even surface; immunity from disease. With the first three points cultivators have surpassed their most sanguine expectations, and it is hoped that by a strict application of Mendelian laws, a strain of potatoes immune to all ills will shortly be forthcoming.

Unfortunately the method of selection and the lines followed in producing these much desired improvements in potatoes have in some instances also favoured other unexpected modifications, which have resulted in sterility or failure to form sprouts by the tubers. This failure has been shown, by a series of experiments conducted at Kew and extending over three years, to be accompanied by a combination of two distinct specific conditions: (i.) more or less arrest of the development of the vascular system of the tuber; (ii.) comparative absence of the ferment or enzyme called diastase from the tuber.

A tuber, as is well known, is the very much swollen terminal portion of an underground branch specialized for the purpose of a vegetative method of reproduction. Such tubers retain, under normal conditions, those structures present in the aboveground stem of a potato plant. The main bulk of a tuber consists of a mass of tissue crowded with starch, which is used up in the formation of new shoots or sprouts. This starch is

Comp. Rend., Dec., 1903, p. 1,006.

conveyed to the growing shoots through certain portions of the fibro-vascular system, which appears to the naked eye when a tuber is cut across, as a thin line forming a ring situated some little distance from the surface of the tuber. Branches from this ring pass outwards to the "eyes" or sunken points from which the sprouts originate. Now the improvement in the tubers, from the culinary standpoint, which has resulted from these methods of selection and inter-breeding, has at the same time been accompanied by a serious degeneration of the fibro-vascular system; in fact, in many examples that have been examined microscopically this system is found to be so much reduced, especially in the branches connecting the main ring with the "eyes," as to be rendered incapable of conveying the necessary amount of food from the tuber to the growing shoots. Consequently the growing shoots are either not developed at all, or only developed as weakly branches devoid of vigour and soon perishing. It is a well-known fact that a quarter of a century ago, stored potatoes (even the varieties most renowned for their "mealy" or "floury" qualities) were apt to become sweet in flavour, watery, and unsuitable for table purposes during the early spring months. Various methods of treatment were devised for preventing deterioration from a culinary standpoint, more especially in the case of potatoes stored on board ship for use during the prolonged voyages of that period. This defect is not apparent at the present day, and many of the best kinds remain unchanged in composition until midsummer or even for a longer period of time.

The primary object of the mass of starch stored up in a tuber is that of supplying formative material for the shoots during their early period of growth until leaves are developed. Before the starch can be utilised, however, it has to be converted into a liquid condition, when it is conducted through the elements of the fibro-vascular bundles to the growing-points. The solution of the starch is effected by means of a soluble ferment called diastase, which is produced in the tuber when the normal season for growth or sprouting arrives. Now in many high grade potatoes at the present day, diastase is produced in such small quantity that it is incapable of converting more than a very small proportion of the starch present into liquid sugar, hence the absence of sprouting is due to a lack of the food material

necessary for the work. For the same reason many tubers remain almost unchanged as to starch contents when the crop is lifted in the autumn. These are illustrations of somewhat extreme cases, but the fact that potatoes in general remain "floury" for a longer period of time than formerly, indicates a gradual and general loss of power on the part of potatoes to produce the necessary quantity of diastase.

A total absence of diastase was proved in the case of tubers that had failed to sprout. In other examples the relative amount of diastase present was ascertained to be in proportion to the number of sprouts formed.

Diastase is first formed, and in greatest abundance, at the apical or free end of a tuber, and for this reason the earliest and most vigorous sprouts are produced in this region in a normal tuber. When the presence of diastase is on the wane it also lingers longest in the apical region; hence, in a large percentage of deteriorating tubers, sprouts from a single apical "eye" are alone produced, as in Fig. 1; and in many instances, where the supply of food is very scanty owing to the absence of diastase, these sprouts perish at a very early age, as shown in Fig. 2. In Fig. 3, which illustrates the grower's ideal even surface—a factor of undoubted value when the loss resulting from paring is the object in view—the power of growing or sprouting has been completely lost, owing to deterioration of the fibro-vascular system and the comparative absence of diastase.

During the past three years a series of experiments have been conducted with the object of imparting new vigour to potatoes intended for "seed." It must be admitted that the results obtained up to the present have not been very encouraging, the time being too short to remove the deterioration which it has taken a prolonged period of more or less intensive cultivation to establish; nevertheless certain points have been noted which may prove to be of value to future experimenters.

Degeneration appears to be mainly due to the vegetative method of reproduction commonly followed. Even in the case of seedlings, the parents of these must at least be closely related.

The nearest approach to a return to normal conditions is in the case of potatoes that have been grown for three years in succession on the same patch of sandy ground and without a trace of manure of any kind. The original "sets" of a highly

Degeneration in Potatoes.

prized modern type were each reduced to the condition of only being able to produce one sprout at the apical end. The product of the third generation formed vigorous sprouts from every part of the tuber, thus proving that abandonment of all forcing or selective tactics enables the plants to regain their power of producing diastase. This result, however, was at the expense of all those points that have cost the cultivator so much time and labour to secure; the crop was small, the tubers few in number and only of average size, the "eyes" considerably depressed.

Superphosphate increased the amount of diastase to a much greater extent than a liberal dressing of farmyard manure.

Light favours the production of diastase much more than darkness, while a greater amount is produced in a high than in a low temperature.

A very interesting discovery on this point was made by Mr. Watson, Curator of the Royal Botanic Gardens. Some tubers that had refused to produce sprouts when placed under the most favourable conditions available to the ordinary grower, were placed in one of the forcing pits having a temperature averaging about 70° F. In due course sprouts were formed in all the "eyes" at the apical end of the tubers. The tubers were then planted and yielded an ample crop of normal potatoes.

Further particulars will be found in the Kew Bulletin, No. 8, 1907.

ORGANISATION OF AGRICULTURAL RESEARCH.

The organisation of agricultural research formed the subject of several papers which were read at the International Agricultural Congress at Vienna. Dr. True the Director of the Office of Experiment Stations of the United States Department of Agriculture, contributed an interesting report dealing with the broad principles which should be kept in view in the organisation of experimental work.

The main portion of Dr. True's paper is reprinted below:—

Agriculture is an industry fundamental to human life and civilization, its interests concern the whole population, and its promotion may well be one of the most important functions of the general government. The agricultural experiment station should therefore be organised as a permanent institu-

tion, and its function should be to benefit agriculture for the sake of the general welfare of the community and not merely for the advancement of the interests of the farmers as a class. For this reason it seems appropriate that the stations should be public institutions and derive their financial support from the general government, at least to a large extent. However, since the individual station works especially in the interests of agriculture in a restricted region, there is no reason why local communities should not have a share in its management and contribute to its support, or that it should not receive financial and other assistance from private sources. As a rule, to secure impartial and effective work the station must be under public control. The way in which this public control should be exercised and the methods by which public funds are to be raised and distributed for the use of the stations will naturally and appropriately conform to the governmental system existing in any country. For it is highly important that the agricultural institutions of a country should be a component part of the governmental system and should be infused with the spirit of the people under whom they are established. For agriculture cannot afford to be considered as a thing apart from the commerce, manufacturing, and social life of the State. Its interests are indissolubly interwoven with those of all other departments of human activity and should be promoted in accordance with the principles on which the State is promoting all other lines affecting the welfare of the people. In the United States, for example, it has seemed most appropriate that the agricultural experiment stations should be established primarily under the control of the States. The Federal government, representing agriculture in its interstate and foreign relations, has therefore confined itself to subsidizing the State stations and exercising over them only such control as is necessary to secure the proper use of the Federal funds granted them. Beyond this, the Office of Experiment Stations in the United States Department of Agriculture gathers the information obtained by the several stations and makes it available to the whole country and foreign nations, and also advises with and aids the State stations in various ways. In addition to the Federal funds, the State stations receive financial support from State

governments, local communities, and private corporations and persons.

A different system of management is maintained in France, where the direction and control of agricultural experiment stations naturally devolve on the general government as represented by its Ministry of Agriculture. Local departments, agricultural societies, educational institutions, have, however, a share in their management and financial support.

Experience shows that the agricultural experiment station is most effective when it is organised primarily as a research institution. And since research flourishes best in connection with institutions for higher education, the stations should be organised as departments of universities or agricultural colleges. This will ensure that their work will be carried on conformably to the spirit and methods of science, and that their results will be directly imparted to the future leaders of intellectual and social progress represented in the youth passing through the universities and colleges. The work of the stations will thus have the most permanent and fundamental influence on agricultural progress.

Since the problems of agricultural regions generally are manifold and complex, the experiment station should have a staff including representatives of the different branches of the science of agriculture and allied sciences. The number and variety of interests represented in the staff will naturally vary with the income of the station and the character of the agriculture in the region in which it is located.

The staff and subordinates should be organised under the general control of a director with power to decide on plans of work and to enforce their execution. The director should be a man of thorough and broad scientific training and keen appreciation of the practical needs of agriculture. He should be able to manage men and affairs and to sympathize with both scientists and practical men. In small stations he may be able to pursue investigations in some special line for which he is fitted, but in the larger stations it will be desirable for him to give his time chiefly to administrative duties.

The station staff should be organised into a council for the discussion of plans of work and other matters relating to the business of the station, but the functions of the council should

be advisory only. After consulting with his staff, the responsibility for determining the policy and work of the station should rest on the director. Each member of the staff should also clearly understand that in matters relating to his own work as a station officer he is to deal directly with the director. It is believed that experience shows that such an organisation secures the most efficient work and at the same time effectually safeguards the individuality of the investigator. The regulations of the station should of course provide for the giving of suitable credit in publications and otherwise to the different members of the staff for the work of investigation actually performed by them respectively.

The number of independent stations which should be established in any country will naturally depend on the area and political divisions of the country, as well as on the range and extent of its agriculture. Each station should, however, as far as practicable be given a field of labour sufficiently large to enable it to be organised on a broad scale and with adequate financial support. For example, in the United States, the State has in most cases been the unit area for which each experiment station has been established. The policy has been to provide each station with an equipment and staff in a considerable number of branches of agricultural science and to increase this equipment and staff as fast as funds for this purpose could be obtained. In this way the equipment of laboratories, plant houses, and live-stock has been made relatively strong and a capable force of experts assembled to do whatever work is required in the interests of the whole State. To provide for field work in agronomy, horticulture or forestry, farms of considerable size have been provided at the stations, but, in addition to these, arrangements have been made with farmers or communities in different localities for co-operative experiments or sub-stations where special investigations can be conducted under the direction of the station officers. When the State has made appropriations for local experiments, sub-stations have often been established under the general direction of the main station. But these sub-stations have been relatively expensive to maintain and have, as a rule, been little more than demonstration fields. A better plan has been to give the main station

funds for local experiments under such terms as will permit the station officers to make the experiments wherever they can best be made, and for such periods as may be desirable to secure definite results. It is better, for example, for the station to be able to conduct experiments temporarily with reference to the introduction of a new crop in 50 localities under the direction of the station agronomist than to have such an experiment made at five permanent sub-stations. If the plant pathologist is called upon to devise a method for the repression of a disease of melons, he should be able to go into the regions where melons are largely grown and make his experiments there.

Since the agricultural experiment station is not only a scientific institute for the discovery of new truth, but also an agency to promote the advancement of practical agriculture, its relations to the university should be such as will promote rather than hinder its close communication with agriculture and agricultural people. Its work should also be sufficiently broad in scope and character to satisfy the requirements of both science and practice. It should, therefore, have funds, equipment, and workers sufficient to enable it to discharge effectively both its scientific and practical functions.

The work of the thoroughly organised station should include (1) original research; (2) verification experiments (with special reference to the local application of results of researches made at the station or elsewhere); (3) demonstrations of experimental results on a practical scale in one or more localities with a view to securing the application of such results to general practice by farmers; and (4) dissemination of information regarding the station's work through publications, addresses at farmers' meetings and agricultural schools, exhibits at fairs, &c.

The stations should have ample funds with which to publish, systematically, accounts of their work in two ways—(1) more or less detailed technical reports as permanent records for scientific readers, and (2) popular and usually brief statements of results and applications for farmers. The popular bulletins should be distributed widely and freely, but publications should not be solely relied on for the dissemination of information from the stations. Unless these are supplemented by

correspondence, lectures, field and other practical demonstrations, exhibits, &c., the results of station work will be but slowly incorporated in general farm practice. Great care should be taken in the preparation of station reports and bulletins so that they will contain clear and adequate statements of the work accomplished and its practical results. Illustrations should be liberally used. This will require that the staff shall contain at least one man of editorial ability and in the case of the larger stations, it will be well to employ a trained editor.

The broad functions of the stations make it very desirable that not only the needs of its scientific work should be considered in organising its staff and employees, but also what is required to make its popular work thoroughly effective. The station investigator cannot do his best work if he is required to do any considerable amount of routine teaching or popular lecturing. He may well, however, be given the opportunity to explain his work and its results to advanced students in agriculture, and in certain cases to important assemblies of representative farmers. To supply the just demand for a wider oral dissemination of information by the experiment stations there should be connected with the stations, or better still with the agricultural colleges and schools, men specially qualified by training and experience to address farmers on the work of the stations, make practical demonstrations of the results of station work, and otherwise spread useful new information among the agricultural people.

The director of the station should also make a broad study of his own and other agricultural regions and of the problems needing further investigation. He should represent the station before important assemblies where the interests of agriculture are being considered and be honoured and respected by all intelligent people as a wise and safe leader in the cause of agricultural progress.

With the rapid growth of public appreciation of the benefits of scientific research in lines relating to the arts and industries, we should be encouraged to give the agricultural experiment stations a broader and more thorough organisation, and to make their researches regarding the numerous unsolved problems of agriculture more complete and effective.

Another paper on the same subject was read by Professor Kosutany of Budapesth, in which he suggested the desirability of researches on subjects of international importance being carried out on a similar method by a number of experimental stations in different countries. An International Commission of Agricultural Research might be formed to decide the points to be investigated and to publish the combined results. Such a Commission might with advantage have its headquarters in Rome in order to keep in touch with the International Agricultural Institute, but might hold meetings every two or three years in different countries.

Professor Kosutany also suggested that a Central Committee or a Central Station might be formed in each country, which should direct and carry out international investigations, as well as investigations of national importance, and generally direct and advise local experimental stations.

THE LARCH SHOOT MOTH.

(*Argyresthia* (*Tinea*) *laevigatella.*)

R. STEWART MACDOUGALL, M.A., D.SC.

Still another enemy of the larch in Britain falls to be recorded in the tiny moth, *Argyresthia laevigatella*. This moth is not to be found in the British lists. Professor Somerville, in sending me some material showing the work of the caterpillar, in the month of May, wrote: "This is a very serious enemy in the neighbourhood of Oxford, and, I believe, has not hitherto been recorded in Britain." From this material I bred out five moths. I have also received from Col. Bailey examples of the damage done by the caterpillars in Bagley Woods, Oxford. Professor Somerville records, in the *Quarterly Journal of Forestry*,* that in the district round Oxford larches up to twenty years of age have been much injured during the past autumn and spring; and in the same number of the *Quarterly Journal of Forestry* Mr. John Bennet records the caterpillars as destructive on young larch near Basingstoke in Hampshire.

Argyresthia laevigatella is one of the *Micro-Lepidoptera*, some of which, belonging to the genera *Retinia*, *Tortrix*, and *Coleophora*, are already well known as harmful forest insects

---

* *Quarterly Journal of Forestry*, Vol. I, No. 3, July, 1907.

very troublesome to combat. It belongs to the family *Tineidæ* and the genus *Argyresthia*. Of this genus there are more than twenty recorded species in Britain. Generally it may be said that *Argyresthia* caterpillars feed in buds, shoots, or fruits. Amongst trees one or other species of *Argyresthia* has been found infesting birch, alder, hazel, oak, beech, goat willow, horse chestnut, apple, cherry, sloe, juniper, and now to these in Britain we must add the species on larch.

A. laevigatella must be considered a very harmful enemy, both because it attacks young larches and because a single caterpillar is able to accomplish the destruction of a whole year's shoot.

Description of Insect.

Moth.—The moth is very small, measuring only 4 to 5 millimetres (less than one-fifth of an inch) in length and 10 to 12 millimetres in spread of wings. The forewings are silver-grey and silky, with a gloss like lead; the fore-edges are

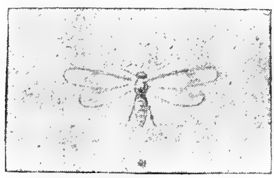


FIG. 1.—The Larch Shoot Moth (*Argyresthia laevigatella*).

somewhat darker; the fringes of these forewings are grey or brownish grey.

The hind wings are dark grey, and not so glossy. The face is white; the base of the antennæ is white and the rest of the antennæ dark and light-ringed. There is a tuft of hairs on the head; the colour of the hairs is given differently by different Continental authorities, in my own specimens the colour is yellow. The abdomen of the moth is dark grey.

Caterpillar.—The larva is pale yellow when young, but later is pale grey, with a dash of red, and is dark striped towards the hind end of the back. The head and the three front pairs of legs are black. The length is 6 to 7 millimetres.

Pupa.—The pupa is dark brown, with a black head; its hind end is distinctly pointed.

Distribution.—The moth is native to Eastern Germany, the Alps, and Holland.

Life History.—The moths issue, through an already prepared flight-hole in the twig, at the end of May and the first part of

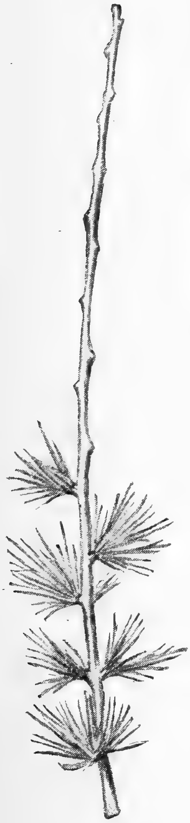


FIG. 2.

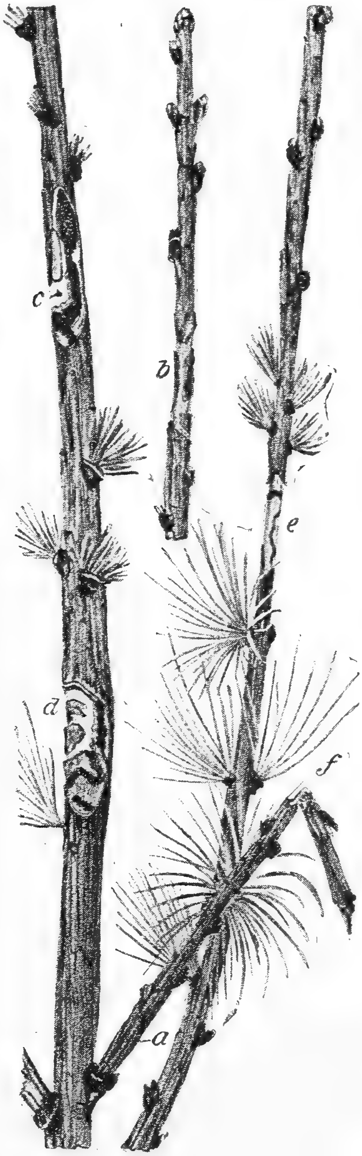


FIG. 3.

Fig. 2.—Larch shoot (half natural size), with upper portion dead as result of infestation.

Fig. 3.—Larch shoots attacked by caterpillar: (*a*) place of entry of young caterpillar; (*b*) the work of the caterpillar; (*c*, *d*, *e*) the borings made by the caterpillar, causing the death of the twig; (*f*) shoot broken by the wind at place of attack (after Eckstein, slightly reduced).

June. The eggs are laid then on the lower part of the shoot of the year, one egg being laid for each shoot chosen. The egg soon hatches. At the time the caterpillar hatches out and starts feeding, by boring below the epidermis, the new larch branch is still developing, and the feeding of the caterpillar at this early stage is not sufficient to prevent the shoot reaching its normal length. As the year goes on the damage is greater, owing to the increased size of the caterpillar and its more extended feeding. Winter overtakes the caterpillar before it is full-grown, and hibernation takes place in the boring it has made. The borings or galleries are partly filled with black excrement and bore-meal.

In late March or in the month of April the caterpillar starts feeding again, destroying right to the wood and ringing the shoot to an extent—in the longitudinal direction—of four-fifths of an inch. The twig dies above this place of ringing.

The caterpillar is full-fed in May, and previous to its pupation it bites a hole through the bark that will serve as a place of exit for the adult moth when pupation is over. This flight-hole is very small. After making the hole the larva spins a light web, which covers over the little hole, and pupates. The moths issue in May and June—my own specimens issued early in June.

The empty pupal covering does not, as is the case with some moths whose caterpillars are branch-borers, show itself projecting from the flight-hole, but the moth itself when ready works or pushes its way through the web covering the flight-hole, and so to the outside.

Result of Damage and Signs of Attack.—In the spring of the second year the attacked shoot fails to develop its buds, and remains brown and withered and without needles. Occasionally the dwarf shoot just above the flight-hole may produce undersized needles. As the shoot is most markedly eaten in the neighbourhood of the flight-hole, breaking takes place here easily, and these broken, bent-over shoots mark the infestation.

Treatment.—The treatment that follows from a review of the life history is to break off the shoots and destroy them before the escape of the moths. Unfortunately no outflow of resin or appearance of excrement at the exterior is noticeable at the place of infestation (marks which in other insect enemies of

trees serve to call timely attention to the fact that they are at work), and the first sign that anything is wrong may only be observed after the moth has flown. Where the moth has already been at work the damage may be expected to repeat itself, and this suggests special observation.

It will be interesting, now that attention has been directed to this moth, to find to what extent it has obtained a footing in Britain.

FATTENING CALVES FOR VEAL.*

T. R. ROBINSON AND C. W. WALKER-TISDALE.

Surplus milk on the farm is not uncommon at certain seasons of the year. In some districts it is customary for cows to come into profit all within a few weeks of each other and thus put a large quantity of milk at the disposal of the farmer, while variations in the local demand and in the supply may leave a considerable surplus to be got rid of; in such cases it is frequently to the interest of the owner of the cows that the milk, or at any rate the separated portion, should be kept at home. Fortunately for the British producer, prime English veal and dairy-fed pork, both of which are produced largely from milk, have long been known for their excellence, and as yet foreign competition has had little effect on their value.

Feeding Calves for Veal.—There are two methods which may be followed in feeding calves for veal, *i.e.*, they may be fed from the bucket or they may be allowed to suck direct from the cows. In either case the calf from a heavy milker will not for a week or two take all its mother's milk, and where this is the case the cow must either be partly milked out or another calf be put to her. The disadvantage of allowing two calves to suck is that one of them may not get sufficient milk to fatten it. Points in favour of hand milking and feeding from the pail are :—(1) All the milk is withdrawn from the cow and the shape of the udder is much improved by hand milking; (2) the excess milk, if any, can be put to some profitable use; for example, the milk drawn first from the udder can be used for the cow's own calf, and the last drawn milk which is richer may be given to an older calf; (3) in the case of there being a deficient

* See also a previous article on this subject, *Journal*, Vol. xiii, p. 727, March, 1907.

supply for the calf, milk from another cow or a milk substitute can be added; (4) after the ninth or tenth week, or when the veal calf has been sold, the cow will, if required, be far more likely to adopt a new calf than if she had been nursing her own offspring. The arguments in favour of allowing the calf to suck the cow may be summed up as follows:—(1) The best veal is always made by the calf which gets its milk in the natural way; (2) the calf feeds little and often, the milk is always fresh and of the right temperature; (3) only a small amount of labour is required; (4) should the calf for some reason not be wanted for veal, it will have had a better start than if brought up by hand. Whichever way of feeding be carried out, the colostrum, or milk yielded by the cow for the first few days after calving, is necessary for the newly born calf. The only really satisfactory calf to feed is one that is dropped full of natural flesh, for it is almost useless to try and fatten those animals so often seen in the market in a semi-starved condition. Not much exercise is required for veal calves, but the very close quarters sometimes seen on old-fashioned homesteads are to be avoided. The calf should have plenty of room to turn round and lie down, and it is better alone than penned up with others. A dry bed is essential to success. Regularity in feeding is most important, otherwise too much may be taken at a meal, or the food too quickly swallowed, thus causing indigestion or diarrhœa. Hand-fed calves should be given their milk at least three times a day. In all cases it should be brought up to its natural heat, care being taken to scald the pails out both before and after use. The extra trouble involved in carrying out these precautions will be well repaid. A lump of chalk for the calf to lick is frequently placed in the manger, the idea being that this will correct the acidity of the stomach.

Calves, like cows, vary enormously in their aptitude for putting on flesh, and also in their capacity for taking milk, according to their growth, breed and individuality. Assuming that a calf would drink on an average 2½ gallons of milk per day for nine weeks the total consumption in that time will be 157½ gallons, and at 3½ gallons per day 220 gallons will be consumed in the same period. Some figure between these two will be a fair average to take. If we assume that 185 gallons represents the quantity of milk required to

produce a calf weighing from 16 to 18 stones and worth £5, the question arises: how does this sum compare with the amount realised by dealing with the milk in some other way? Where milk can be sold for 6*d.* a gallon, 185 gallons of new milk would bring in £4 12*s.* 6*d.* Converting a similar amount of milk into hard cheese and calculating that 1 gallon of milk equals 1 lb. of ripe cheese at 7*d.* per lb. the figure arrived at is £5 8*s.*, to which must be added a few shillings for the value of the whey. In butter-making, 2½ gallons of milk may be expected to make 1 lb. of butter, so that 185 gallons of milk would produce 74 lb. of butter, which at 1*s.* 1*d.* per lb. would come to £4 0*s.* 2*d.* plus the separated and butter milk which would be worth on the farm from 1*d.* to 2*d.* per gallon. In each of these examples the value of the newly dropped calf must be added, which in the case of an ordinary shorthorn may reasonably be expected to be worth £1 or more.

Estimate of Comparative Gross Returns from Calf and 185 Gallons of Milk.

	£	*s.*	*d.*
New milk selling—			
185 gallons of new milk at 6*d.*	4	12	6
Calf, few days old	1	0	0
Total gross returns from milk and calf	5	12	6
Cheese making—			
185 gallons of milk = 185 lb. of cheese at 7*d.*	5	7	11
Value of whey on the farm, say 160 gallons at ½*d.* ...	0	6	8
Calf as above	1	0	0
Total gross returns from calf and cheese making... ...	6	14	7
Butter making—			
185 gallons of milk = 74 lb. of butter at 1*s.* 1*d.* ...	4	0	2
Separated milk at 1*d.* per gallon	0	14	0
Butter milk, estimated at	0	1	0
Calf as above	1	0	0
Total gross returns from calf and butter-making... ...	5	15	2

About 10 gallons of milk, or say 5*s.*, might be deducted for the colostrum, which would have no value except for calf feeding. This gives the revised totals as:—

	£	*s.*	*d.*
Milk selling	5	7	6
Cheese making...	6	9	7
Butter making	5	15	2
Veal production	5	0	0

In the above estimate the calf pays a little more than 5*d.* per gallon of milk consumed, as the value of the newly-born calf must be deducted, leaving £4 as payment for the

milk, but it frequently happens that the butcher prefers a younger animal, in which case less milk will have been required. The prices in the table are approximate only. New milk, for example, is often worth more than 6*d.* per gallon, just as fat calves are often worth less than £5 ; indeed some of the best quality veal calves only weigh about 14 stone of 8 lb. dead weight, which at 5*s.* 6*d.* a stone comes to £3 17*s.*, and at 6*s.* per stone to £4 4*s.* Veal cannot be made profitable when both milk and calves are dear, but reverse this order and given the three essentials of cheap calves of the right stamp, a plentiful supply of surplus milk and dear veal—and good quality veal often sells well in the spring—then the fattening of calves should become a paying occupation. As before stated, the work is small compared with dairying, which involves a considerable outlay both for implements and skilled labour, the latter commanding a high rate of remuneration.

SOME NOTES ON THE FOOD OF BIRDS.

CECIL H. HOOPER.

In fairness to cultivators of the soil, whether as farmers, fruit-growers, or market gardeners, it is desirable to endeavour to obtain an unbiassed estimate of the relation between birds and crops, taking account both of the good and harm done. In the United States there is a special branch of the Department of Agriculture dealing with economic ornithology, which arranges for many thousands of birds to be killed annually in order to ascertain their food at different times of the year. In the British Isles this work has been left chiefly to naturalists and other observers, who have, however, not all worked on a common system of inquiry. In some cases special study has been devoted to certain birds, of which perhaps the best known is the valuable little book on the house sparrow by Col. C. Russell and Mr. J. H. Gurney, published in 1885, while the Highland and Agricultural Society's *Journal* for 1896 contains an article of ninety-two pages devoted to "Bird Investigation" in which the relation of wood-pigeons, rooks, and starlings to the agricultural interest, as shown by their diet, is discussed. More recently a pamphlet was published under the title "The Rook as a foe to Sport and Agriculture."

Valuable as these and other investigations are, it is clear that a great deal still remains to be done and the subject needs further treatment in a comprehensive spirit.

The following observations, which are based on some seventy replies from fruit-growers, farmers and gardeners, which I received in answer to a schedule of questions sent out after consultation with Mr. Cecil Warburton, Zoologist to the Royal Agricultural Society of England, are offered merely as a basis for further study.

The questions which I sent out are given below with a summary of the replies.

1. Have you seen any wild birds eating slugs ?

Blackbird mentioned in 10 replies, starling (9), thrush (5), plover (3), wagtail, fieldfare, gull, robin, ducks, and pheasants.

2. Have you seen any bird, other than the song thrush, eating snails ?

Blackbird (10), missel thrush (3), starling (2), rook, jackdaw, gull, and robin.

3. Have you observed any of the following pests eaten by birds and by which bird ?

Looper Caterpillars of the Winter Moth.—Starling, blue tit, robin, and rook. The house sparrow, finches, and other small birds are said to eat these caterpillars when nearly mature, and just previous to their letting themselves down from the trees.

Lackey Moth Caterpillars.—The rook has been seen eating them when hanging in bunches.

Ermine Moth Caterpillars.—Thrush and long-tailed tit.

Weevils and Caterpillars.—Starling.

Codlin Moth Chrysalids.—Tree-creepers.

Bud Moth Caterpillars.—Blue, coal, and great tits.

Other small birds that feed their young on caterpillars and maggots found on the branches and trunks of trees include the chaffinch, wren, and flycatcher.

4. Have you seen any bird feeding on the larvæ of the *Gooseberry Sawfly* or on *Magpie Moth Caterpillars* ?

Very few birds eat either of these. Cuckoos and house sparrows are sometimes seen eating them.

5. Have you seen birds eating *Scale* on apple trees or on gooseberry or currant bushes ?

The long-tailed, blue, and other tits eat mussel scale on apple bark, as does also the tree-creeper, but the amount eaten is proportionately very small, and is not sufficient to affect the pest to any extent. No bird appears to touch scale on either gooseberry or currant.

6. Have you seen any bird eating *aphis* on red or black currant, plum, damson, cherry, or apple ?

One grower from Sussex wrote :—" My trees are usually covered with aphis, but I have never seen any bird even apparently eating the insects." The birds that are from time to time noticed eating aphides include the tits and to a limited extent the house sparrow ; the house sparrow and chaffinch are mentioned as having been seen eating aphis on cherry and chrysanthemum ; the pied wagtail and long-tailed tit have been seen eating the black aphis on black currants ; the wren and hedge sparrow eat aphides on Brussels sprouts. Other birds occasionally seen eating aphides include the willow and golden-crested wren, the lesser whitethroat, and the starling.

The amount of aphis eaten by birds on fruit trees and bushes is economically minute, and spraying is infinitely more effective.

7. Have you seen *Woolly aphis* eaten by birds ?

This is very rarely touched by any birds ; tits, wood, and willow wren appear to eat it occasionally.

8. Have you seen any bird eating *Apple Sucker ?*

No bird is definitely known to eat this most serious pest. One grower has seen swallows in hundreds catching the winged apple sucker as the trees were shaken by the apple pickers.

9. What birds beside the house sparrow do you consider should be reduced in number ?

Bullfinch (mentioned in 29 replies), blackbird (27), starling (17), greenfinch (14), song thrush (13), rook (11), chaffinch (10), blue tit (10), wood pigeon (9), missel thrush (7), hawfinch (5), jay (4), lark (3), brown linnet (2), magpie (2), dove (1), and hawk (1).

REMARKS AS TO THE FOOD OF BIRDS. SUMMARY OF REPLIES.

House Sparrow.—Devours corn, seeds, young pea shoots, and causes damage to buds of gooseberry, red currant, and damson, especially near buildings ; it picks off cherry and plum blossom, and to a small extent eats cherries, red currants,

and strawberries. Of late years it has been observed to devour red currants before they have turned colour. Eats lettuce, crocus, and polyanthus flowers, takes wheat and barley from the growing ear, also the shoots and plumules of sprouting grain. The amount of insect food eaten is comparatively small, as it feeds its young very early on grain, but daddy-long-legs and green caterpillars, including caterpillars of the winter moth, and probably *Tortrix viridis* are given to the young. Mr. Batchelor, of Cliffe, has seen it eating caterpillars on gooseberries, and it also eats some aphis on damson and other trees; Rev. Theodore Wood has known it eat *Sitones* weevils on peas. To the farmer, fruit-grower, and gardener the sparrow is a destructive bird and should be reduced.

Bullfinch.—Complaints have been received from Kent, Worcester, Hereford, Gloucester, and Hants as to its destructiveness to gooseberry, plum, cherry, and other fruit buds. Greengage, Black Diamond and Monarch plums, and damsons are specially attacked. Mr. W. B. Tegetmeier wrote to the *Field*, 22nd December, 1906:—"I have taken no less than eighty-four perfect gooseberry blossoms from the interior of one bullfinch, and unless fruit of this kind is protected by netting, its growth is impossible" (near London).

Blackbird.—Complaints as to this bird are numerous from fruit districts. It is said to be "by far the greatest offender in attacking fruits" (Hants). It eats strawberries, gooseberries, raspberries, red currants, Logan berries (but not blackberries), apples, pears, plums, cherries, figs, mulberries, and tomatoes. "It has increased enormously during the last few years, there has been no severe winter to clear them off, and the Bird Protection Act has the effect of increasing them so that their natural food is insufficient for them" (Kent). A correspondent reports that he had to give up red currant growing in Hereford. Except during fruit time it is a harmless or useful bird, eating worms, grubs, &c.

Starling.—This bird is said to be "very useful for part of the year, as it devours the leather-jacket grub and wireworm," but a number of correspondents state that it is one of the most serious enemies to fruit. One writer referring to the district of Essex between Colchester and Maldon observes:—"Only one bird is dangerous to my crops—that is the starling.

He threatens the utter destruction of our strawberry, raspberry, cherry, gooseberry, and currant and some other crops. The birds are said to come to us from the marshes as soon as the young are hatched, and they come in millions, in flocks that darken the sky. Their flight is like the roar of the sea or like a train going over the arches. Their number increases rapidly each year. I can look back to the time when there were few and have watched their increase for forty years till now it is intolerable. They clear off the crop of a field or two in a day like the locusts, and pollute the woods where they lodge." In two replies observers mention having seen starlings eating looper caterpillars.

Missel Thrush.—In Kent this bird has acquired the habit of eating pears, apples, and plums in addition to cherries. Being an early breeder and finding a secure nesting place in parks and woods, the young are just ready for the cherries and swoop down in thousands on the orchards; it is nearly as destructive as the blackbird, but rather easier to frighten. It eats berries of many kinds, including the black currant, which most birds avoid, and also damsons. It does no harm except in fruit time, its food at other times being worms, insects, and the berries of yew, mountain ash, and holly.

Song Thrush.—This bird is useful as an insect and snail destroyer and eats large quantities of worms, but is partial to cherries, particularly in dry weather when natural food is hard to get, and also eats strawberries, red currants, and ripe gooseberries. It is said to eat raspberry weevils.

Greenfinch.—This is a terrible pest among hops, pulling the cone to pieces for seeds, it also eats newly sown and sprouting seeds of turnip, radish, and ripe corn. It pecks buds of gooseberry, plum, and pear to a considerable extent, but not as badly as the sparrow and bullfinch. In its habits it is very similar to the chaffinch except that it eats very few insects and is if anything more destructive to sprouting crops. It is a great weed eater.

Chaffinch.—This bird eats various kinds of larvæ, green fly, &c., but like the sparrow pecks buds off red currants and gooseberries and is very destructive to freshly sown and sprouting crops, such as turnips, radish, lettuce, salsify, peas, &c. It bites off the blossoms of cherries and plums, presumably to get the honey. It destroys large numbers of caterpillars that live on

apple trees, as well as aphides, which are given to the young. Mr. H. Rivers, of Sawbridgeworth, states that on 17th July he noticed a chaffinch fly to the ground with a plum leaf covered on the underside with aphides (*Hyalopterus pruni*) and found other leaves from which the bird had already pecked the aphides. The chaffinch also eats corn.

Hawfinch.—This bird is not common but is considered to be increasing. It attacks peas severely, also cherries and nuts. A Herefordshire grower wrote :—" They attack plum and pear buds to a very considerable extent."

Rook.—This bird eats large quantities of leather jackets, chafer larvæ, wireworms and other grubs, and occasionally the caterpillars of the winter moth and of the Oak tortrix moth, also slugs, young field voles, sometimes fowls' eggs and young chickens, partridge eggs, and young. It is generally agreed that it is a useful bird if not too numerous, and is specially beneficial on grass land. In many parts it is too numerous, when it becomes destructive to freshly sown fields of corn, peas, and beans. A correspondent in Hants wrote " that for three years rooks spoilt quite two-thirds of the potato crop, boring down to the tubers." They do not venture as a rule into ordinary gardens, preferring the fields, but will attack cherries, walnuts, nuts and gooseberries, and will take strawberries quite green from the field if let alone, but they are easily scared.

Jackdaw.—The jackdaw eats cockchafer grubs, wireworms, and leather jackets, like the rook it will strip trees of walnuts, and where numerous is destructive to peas and grain crops. It is a very destructive bird to game eggs, poultry, and their young, and will completely clear nests of small birds of their eggs and young. In Kent the jackdaw seems to be somewhat rare, but in some counties, such as Hereford, it is common. A correspondent writes that " on examining a jackdaw which had been shot it was found to have in its beak 13 wireworms, 4 grubs, and a few other insects. This bird was a male and had come to feed its mate which was sitting on the nest."

Jay.—This bird is useful in destroying blackbirds' eggs, also young mice, and, like the magpie, it will eat almost any variety of young birds. It is mentioned as eating ripe strawberries, apples, plums, and nuts. Of insect food it eats chafers

and other beetles. In most parts of the country jays are too few in number to do much damage and are well thinned down by gamekeepers.

Wood pigeon.—Many correspondents condemn the wood pigeon as an unmitigated pest, and from an agricultural and horticultural point of view it seems to have no redeeming point, as it does not eat insects, its food throughout the year being grain, vegetables, fruit, and forest seeds.

Blue tit.—The blue tit and great tit spoil apples and pears, especially the later pears of best quality, which they puncture near the stalk. They are most persistent and have been known to make their way through a mesh of garden netting which had been used to protect wall-grown pears. They are great insect eaters and feed the young on caterpillars collected from fruit trees. The blue and long-tailed tits eat scale on apple, gooseberry, and red currant. One correspondent states that :—"After several hours watching I was rewarded by seeing eight or ten tits visit the apple trees and feed on mussel scale. The amount of good done in this way is not sufficient to keep the pest down and there would always be a fair amount of scale (which the tits could not reach) left for breeding purposes" (Woburn, Beds). They are fond of sunflower seed which may be grown to allure them from pecking apples and pears. The long-tailed tit has also been reported as taking Ermine moth caterpillars, while the blue tit and the tree-creeper have been known to eat the female winter moths caught on the grease bands, as well as the woolly aphis. The general opinion of the replies seems to be that the blue, long-tailed, and coal tit are useful birds, destroying many insects, though in some localities the blue tit may be too numerous. Blue tits are sometimes troublesome in vineries, spoiling the grapes by taking a peck out of each.

The Blackcap is an insect eater, but is a lover of cherries, figs, and raspberries.

Whitethroat and other Warblers.—Mostly insect feeders, but will eat peas, and are reported as eating soft fruits, especially raspberries.

Robin.—The robin is decidedly an insect feeder, though it also attacks currants, strawberries, cherries, grapes, and figs when ripe.

Wren.—This bird is insectivorous and is reported as wholly beneficial.

Willow wren.—This bird being insectivorous is one of the gardeners' best friends, and is often found in numbers in orchards and gardens. The smaller willow wren and the wood wren have often been seen feeding on aphis.

Golden Crested Wren.—Devours scale insects readily.

Hedge Sparrow.—This bird is also insectivorous and wholly beneficial.

Cuckoo.—One correspondent suggests that this bird should not be protected, as it lays its eggs in the nests of birds which are mainly insect feeders and destroys their young. On the other hand, it is stated that the young in all cases are fed on caterpillars, and that the food of the adult is mainly flying insects, hairy caterpillars, caterpillars of ermine moth and woolly bear. One writer says he saw cuckoos eating gooseberry sawfly larvæ.

Tree creeper.—This is harmless and a good insect destroyer.

Nuthatch.—This bird takes cob nuts and filberts, but is otherwise harmless and a good insect destroyer.

Spotted flycatcher.—The reports on this bird are all favourable. It is mentioned as destroying aphides and the gooseberry sawfly.

Pied wagtail.—This is reported as insectivorous.

Woodpecker.—One observer reports on 24th April that the lesser spotted woodpecker was seen on the trunk of an old *Pyrus spectabilis* which was honeycombed by clearwing moth caterpillar. It is also believed to take the *Xyleborus despar* beetles from the branches of plum trees.

Goat-Sucker.—This is stated to eat moths and to be very useful.

Martins, Swallows, and Swifts.—These are reported as devouring moths, aphides and other insects.

The Plover.—With regard to the plover, one writer states that he has "reason to believe that the green plover feeds upon the small black slug which infests strawberry plants. The extensive strawberry fields in some parts of Herefordshire are frequented during autumn and winter by flocks of peewits, which are encouraged and never disturbed."

Kestrel and Barn Owl.—One correspondent says :—"I am sorry to say the kestrel is rapidly disappearing. I have observed him for sixty years and rarely indeed has he been

caught in any mischief; his food is mice and beetles, and occasionally a lark or small bird." Another writer mentions that he has "counted over twenty mice in the larder of the barn owl for its young. It will occasionally kill a greenfinch or sparrow, but not game."

Brown Linnet.—This is said to be destructive to small seeds such as mustard, radish and cabbage, also corn and hops.

Goldfinch.—This is a most useful bird as a seed-eater, as it splits seed before eating it; some other birds eat thistle seed without splitting and the seed may therefore be distributed.

Larks.—Larks are generally reported as very destructive to growing crops, strawberries, peas, cabbage, and green crops.

Food Habits of the Black-Headed Gull.

A report has lately been issued by the Cumberland County Council embodying the results of an inquiry into the food habits of the black-headed gull, *Larus ridibundus*, as affecting the farming and fishing industries in Cumberland. The report contains a statement as to the contents of the stomach and gullet of 100 examples of this bird taken at a variety of places and at different seasons of the year.

A number of questions were put to naturalists, anglers and fishermen, farmers, and gamekeepers, and a summary is given of the replies of 34 naturalists, 11 anglers and fishermen, 14 farmers and 3 gamekeepers, representing the opinions of 62 qualified observers Of these it may be remarked that 21 had personally examined the contents of the stomach and gullet of the birds. The following table shows the opinions expressed:—

	Farming.				Fishing.			
	Harmful.	Not Harmful.	Beneficial.	No Opinion.	Harmful.	Not Harmful.	Beneficial.	No Opinion.
34 Naturalists … … …	1	21	12	—	4	20	5	5
11 Anglers and Fishermen …	1	2	3	5	7	4	—	—
14 Farmers … … …	2	4	8	—	—	3	1	10
3 Gamekeepers… … …	—	1	2	—	—	2	—	1
62 Opinions … …	4	28	25	5	11	29	6	16

Of the 100 birds examined 40 contained food which would lead the bird to be classed as "harmful," *e.g.*, fishes, cereals, useful insects; 47 contained "beneficial" food, *e.g.*, injurious insects and mollusca, carrion and waste animal matter, and 82 contained "neutral" food, *e.g.*, earth-worms, crustacea and spiders, harmless insects and mollusca, and vegetable matter other than cereals. As anticipated, it was found that the food taken was very variable in description, varying not only according to season and opportunity, but also apparently according to individual taste.

A very large proportion of the birds examined (42 per cent.) contained earthworms, and if a staple food may be understood as the one most generally and extensively taken, then earthworms may be regarded as the staple food of the species in the district under consideration. Wireworms (see the Board's Leaflet No. 10) were extensively taken, and 41 per cent. of the birds examined contained these and the larvæ of *Tipulidæ* (crane-flies or daddy longlegs, Leaflet No. 11), both of which groups of insects are decidedly harmful. Only one bird was found to have taken harmful mollusca, but it was responsible for 30 common slugs, *Limax agrestis*. Beetles—injurious, harmless, and beneficial—were taken indiscriminately, and 15 per cent. of the birds examined had taken some species of ground beetle (*Carabidæ*). Flies were also largely taken.

Fish as a food appeared to be sparingly eaten, partly from want of opportunity, for the black-headed gull does not readily obtain fish from water more than a few inches in depth, and partly from the greater ease with which other food can be procured at most seasons of the year. Only 9 per cent. of the birds had fed upon fish of any description. Of 36 birds taken on the Eden between Carlisle and Rockliffe only 7 contained traces of fish. The writers of the report (Mr. D. Losh Thorpe, and Mr. L. E. Hope, Curator, Carlisle Museum) say that although they have had the black-headed gull under almost daily observation on the river Eden for several years, and especially so during the 13 months the investigations have been going on, they have never detected the bird in the act of catching a fish.

The largest proportion of food was found to consist of vegetable and animal matter considered neutral in nature, but 14

birds had taken oats. It is considered that if any injury is done to the farming or fishing interests it is due to abnormal increase, and that if the birds can obtain a sufficiency of insect or annelid (worms) food they will not resort greatly to either fish or cereals. The large proportion of insects and worms taken is sufficient proof as to the kind of food preferred, but if the bird should become so abundant as to occasion a shortage of this class of food, there is a probability of its becoming more addicted to the taking of grain (a habit which seems to have only been observed during recent years), and to eating fish when procurable.

Grain Weevils.

Grain weevils (*Calandra granaria* and *Calandra oryzæ*) are extremely destructive to stored grain and to cargoes of grain in ships. Cargoes of grain and rice carried long distances sometimes arrive swarming with the pests. The weevils, too, are often very troublesome in breweries and malting sheds. Wheat, barley, oats, and Indian corn may be infested and *C. oryzæ*, as its specific name implies, is very harmful to rice.

The harm is done both by the adult weevils and their grubs. The weevils feed on the grain, eating into it and so hollowing it out that a mere husk may be left. After the contents of the grain have been partly eaten away, it is common to find several weevils at work inside the damaged grain. The grub is hatched inside the grain and spends its whole life there, so that by the time it is full grown the grain is ruined. The species of the genus *Calandra* are really natives of warmer countries abroad, but some of the species have been spread in commerce and *C. granaria* at least may now be considered a native of European countries.

Characteristics of these weevils are the long snout with elbowed antennæ, and the narrowed body with its long thorax.

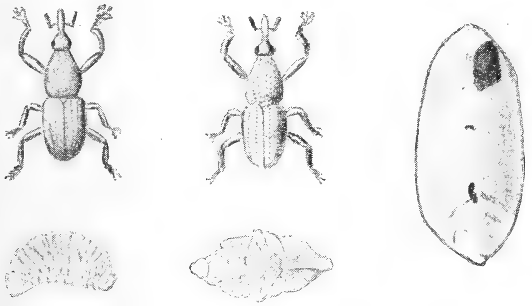
Description.—*C. granaria* measures $\frac{1}{8}$ in. in length. In colour the beetle is brownish-black or pitchy; the elbowed antennæ and the six legs are reddish. The snout or rostrum, with the mouth at the end of it, is long but is rather shorter and stouter in the male than in the female. If examined with a lens the thorax is seen to be covered with punctures; the

wing-covers are striated and also show punctures. *C. oryzæ* is very similar to *C. granaria*, but they may be distinguished as follows :—

Calandra granaria.	*Calandra oryzæ.*
All one colour, and with a more shiny surface. Punctures on thorax larger, not so close together, and oblong. No functional flying wings.	The wing-covers have two orange-coloured patches at the apex and at the base. Punctures on thorax smaller, closer, and rounder. Well marked flying wings.

Larva.—The grubs are white, with yellow-brown horny heads and biting jaws ; the body is wrinkled and without legs.

Life History and Habits.—The females lay one egg in each grain. The grub on hatching feeds on the contents of the grain and when full fed pupates in the eaten-out grain. In conditions extremely favourable to the weevils



WEEVILS OF *C. granaria* (ON THE LEFT) AND *C. oryzæ* (ON THE RIGHT), WITH GRUB, PUPA AND DAMAGED GRAIN.

the whole life-cycle can be completed in a month, but at lower temperatures and with the ordinary conditions a considerably longer time is taken. Professor F. J. Cole* in his experiments found that a temperature of 80° Fahr. was the most favourable for the development of the beetles. *C. granaria* can stand out against lower temperatures than *C. oryzæ*, while the latter can, on the other hand, endure higher temperatures than *C. granaria*. Moisture in the form of water-vapour is very favourable for the weevils. Professor Cole shows how a close and confined atmosphere favours the weevils because it involves a rise in temperature and the accumulation of water vapour.

I have found that in small corked tubes containing grain at ordinary temperatures, with the confined atmosphere and the

* "The Bionomics of Grain Weevils."—*Journal of Biology*, 1906, Vol. I, Part 2.

moisture present in the grains themselves, *C. granaria* will live a long time and will copulate and lay eggs. In an experiment with 24 *C. granaria* kept in such tubes in a sitting-room that had a fire in winter, some of the beetles lived for nearly 14 months; there was no hibernation in the winter, and $7\frac{1}{2}$ months passed before the first beetle died. Eggs were laid in every month of the year. Four such tubes from which the weevils that had laid eggs in the grain had been removed, were kept securely corked for 9 months. The tubes showed at the end of this time frass and moisture and mouldy grains. Each tube held weevils that had developed from the egg stage in the enclosed grain. These weevils were counted and numbered in the four tubes respectively, at the end of 9 months, 67, 80, 81 and 134, a number of them being alive.

The *Calandra* weevils on being touched or shaken feign death; they lie, often for a considerable time, refusing to show any signs of life though handled. I found that one could induce movement by breathing on them.

Remedial Measures.—(1) Fumigation with bisulphide of carbon is a very satisfactory way of ridding grain of the insects. The grain to be treated should be put in a bin or air-tight receptacle, and the bisulphide of carbon poured into a saucer or shallow vessel and laid on the top of the grain. The liquid volatilises readily and the fumes, being heavier than air, sink down through the grain and kill all insect life; 1 lb. of bisulphide of carbon is sufficient for 100 bushels of grain. The air-tight receptacle should be kept closed for 24 or 48 hours. A shorter time would do for small quantities of grain. In disinfecting a store or mill, 1 lb. of bisulphide of carbon is sufficient for every 1,000 cubic feet of space. Before entering the mill after such fumigation the doors and windows should be thrown open for an hour or two in order that the place may be well ventilated.

Bisulphide of carbon has a very disagreeable odour and as the fumes are poisonous they should not be breathed, though a little will do no harm. It is also explosive, so that a naked light should not be brought near it.

Sieving or Screening.—(2) Infested grain may be run through a sieve or a screen, the meshwork of which is sufficiently fine to keep the grains back and yet let the weevils fall through,

these being caught in a receptacle placed underneath containing paraffin. This sieving or screening, however, fails to reach grains that contain eggs or developing larvæ. The same objection can be urged against the practice of screening under a strong air blast, for infested grains will still to some extent remain behind.

(3) For cargoes in ships, ventilate throughly, keeping down the temperature and keeping the grain dry.

R. STEWART MACDOUGALL.

Notes on Insect, Fungus and Other Pests.*

During the past month the number of species of insects and fungi forwarded for identification, which have not hitherto been dealt with in these notes or in the Board's leaflets, has been less than during August, and for this the season is no doubt largely responsible, farmers, gardeners, and fruit growers being exceptionally busy.

FLIES.—Specimens of the wheat midge (*Cecidomyia tritici*) were sent from Avoch, Ross-shire. A note on this pest appeared in the *Journal* for September, p. 353. One of the difficulties of dealing with this insect lies in the fact that it may also breed in a number of wild grasses. All hedgerows and waste spots of ground should therefore be kept well trimmed where an attack of *C. tritici* has been experienced.

Maggots in Mushrooms.—Referring to the note at the foot of p. 353 of the September issue of the *Journal*, the fly has now been bred out, and has been found to be a fly belonging to the family *Phoridæ*, or hump-backed flies. These insects feed on decaying vegetable matter and dead insects, while live insects and snails may also be attacked.

Specimens of the onion fly (*Phorbia cepetorum*) were received from a correspondent at Glasgow, where onions and leeks were being attacked on sandy soil. This pest is dealt with in Leaflet No. 31.

---

* Notes on insect, fungus and other pests, dealing with the specimens submitted to the Board for identification, and their apparent prevalence, will appear in this *Journal* month by month. The notes commenced with the issue for June, 1907.

HYMENOPTERA.—From Saffron Walden and Sundrum, Ayrshire, specimens of the giant wood wasp (*Sirex gigas*) were sent by correspondents who stated that conifers were being damaged. Wood wasps were fully dealt with in the May (1907) issue of this *Journal*.

The caterpillars of the large larch saw-fly (*Nematus Erichsoni*) appeared in large numbers, in August, on young Japanese larch in a plantation at the foot of Skiddaw, close to the original outbreak (on the Merehouse Estate) described in this *Journal* in October, 1906. Leaflet No. 186 deals fully with the large larch saw fly. The measures recommended in par. 7 on p. 8 of the leaflet should be carried out during the winter if the area attacked by this pest is not too large to render treatment impracticable.

EELWORMS.—Among other pests, ears of wheat forwarded from Aldbourne, Wilts, were found to be affected with "purples" or "ear-cockles," caused by the eelworm *Tylenchus tritici*, Bastian. The blackish grains were crowded with eelworms, and when such grains are sown with sound seed the eelworms escape and enter into growing seedlings. As the plants grow, the eelworms ascend until they eventually reach the ear and enter the young grains. It is important that diseased grain should not be sown, and to ensure this all grain for seed may be covered with water and well stirred. The diseased grains will rise to the surface and may be skimmed off and destroyed.

FUNGI.—A correspondent at Chipping Norton sent specimens of diseased wheat, the straw of which bore numerous brown spots. These it was found were caused by a minute parasitic fungus (*Helminthosporium gramineum*, Rabh.), which, when present in quantity, produces "blindness" of the ears. Oats, barley, and some wild grasses are also attacked. It is advisable to avoid sowing seed grown in an infected district. If such seed is sown it should first be sprinkled with 1 per cent. of commercial formalin, or 10 per cent of copper sulphate (blue stone) in water, and thoroughly turned and mixed so that every portion is brought into contact with the solution. This disease was described in the *Journal*, Vol. xii, p. 347, September, 1905.

Celery Leaf Blight.—Diseased celery plants from Norwich

were attacked by celery leaf blight, caused by *Cercospora apii*, Fr. Such plants should be sprayed at intervals of eight days, commencing when the foliage is quite young, with an ammoniacal solution of copper carbonate. This solution should be prepared by mixing 1 oz. carbonate of copper with 5 ozs. carbonate of ammonia in about a quart of hot water. When thoroughly dissolved, 16 gallons of cold water should be added. If thoroughly done two or three sprayings should suffice to suppress the disease. All diseased leaves should be burnt.

Fungus on Plum Trees.—From Petersfield the Board received specimens of plum trees which bore black incrustations on the upper surface of the leaves. This was due to the growth of a non-parasitic fungus (*Capnodium Footii*, Berk. and Desm.), which develops on the "honey dew" deposited by aphides. Aphides should be kept down as suggested in Leaflet No. 104.

The same specimens were infested with the white mould of *Sphaerotheca mali*, Magnus, to combat which half-strength Bordeaux mixture should be used when the leaf-buds are expanding. *S. mali* is described in the September issue of this *Journal* (p. 358).

Other specimens received included brown rot of fruit (see Leaflet No. 86) from Oakham; European gooseberry mildew (Leaflet No. 52) from Norwich, Cheddar, (Somerset), Truro, Little Clacton, and Sittingbourne; black scab of potatoes (Leaflet No. 105) from Crieff, and Bootle (Cumberland); and potato disease, *Phytophthora infestans* (Leaflet No. 23) from Stafford.

Method of Drying Hay in Sweden.

The Board have received through the Foreign Office a note on a method employed for drying hay in central and northern Sweden, where the season is apt to be very wet at the time of hay harvest. A number of light poles some 9 or 10 ft. long are prepared, with pointed ends. When the crop is cut, the poles are driven into the ground in the field in lines of four or five, a yard or so apart. They are placed in convenient places, and the two ends are strengthened by a cross support (see Fig. 1). Tarred cord is then stretched crosswise between the poles in three or four lines (Fig. 1) and

the long grass or vetch is then thrown over the cords. It is thus in rainy seasons kept off the ground, and as the wind constantly blows through it, it dries rapidly after a shower, and a few hours' sunshine will suffice to bring it to a proper condition for carrying. The poles and cords are then moved elsewhere as required. By this system in wet summers, practically 90 per cent. of the hay is saved, and the initial expense of cutting the poles (which last many seasons) and of providing the cord is well repaid. This method is universally used in central Sweden.

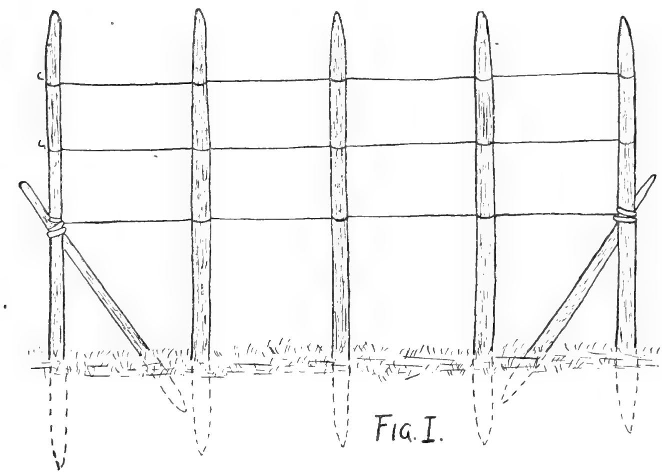


FIG. I.

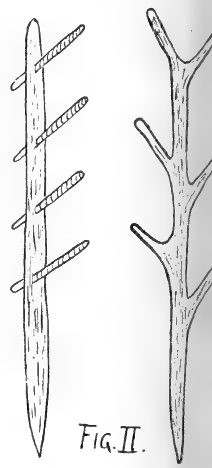


FIG. II.

Further north the poles are prepared with cross pieces inserted or have short branches left on them (see Fig. 2), and light bars of wood are laid across the supports instead of the tarred cord. It is remarkable how few of these groups of poles suffice to hold up to the air the whole of a heavy crop.

In Sweden wood is, of course, extremely plentiful and is found on every large estate, so that the initial cost is comparatively small. The method might, however, be worth while considering even in parts of Great Britain where the cost of light poles would be much heavier. It would be especially practicable in all districts where spruce and fir are abundant.

The Glanders or Farcy Order of 1907.

The Board of Agriculture and Fisheries have addressed the following circular letter to Local Authorities in Great Britain on the subject of the Glanders or Farcy Order of 1907, which will come into operation throughout Great Britain on 1st January, 1908.

Before deciding to make the new Order the Board laid before the Lords Commissioners of His Majesty's Treasury the representations which had been made to them that the cost of compensation, or at any rate a substantial portion thereof, should be made a charge upon money provided by Parliament; but, after very full consideration, their Lordships decided that these proposals could not be sanctioned. In coming to this decision their Lordships were mainly influenced by the fact that under Section 19 of the Diseases of Animals Act of 1894 it is clearly contemplated that compensation payable under any Order of the Board for animals slaughtered by the Local Authorities as diseased or as suspected of disease, in the case of diseases other than cattle plague, shall be paid by Local Authorities out of the local rate, and there appeared to their Lordships to be no sufficient reason for departing from the principle laid down by Parliament in connection with operations undertaken against glanders. Whilst regretting the view adopted by the Treasury, the Board have not felt that it should deter them from proceeding with an Order in which the mallein test is recognised as the basis for diagnosis, which is not the case as regards the Glanders and Farcy Order of 1894 at present in operation.

The compensation payable for a horse, ass, or mule slaughtered under the existing Order as diseased may not exceed one-fourth of the value of the animal immediately before it became diseased. This rate of compensation is maintained in the new Order so far as regards an animal in which the clinical symptoms are definite evidence of disease. In view, however, of the adoption of the mallein test in aid of diagnosis it has become necessary to make provision as regards compensation for an animal slaughtered on the evidence of that test. It is apparent that the intrinsic value of such an animal to its owner considerably exceeds that of a clinically diseased animal, and the Board have thought that the

compensation to be paid for an animal slaughtered in such circumstances under compulsory powers may fairly be one-half its value immediately before it became diseased, and full value if on *post mortem* examination the animal is found to be free from disease. The maximum full value is for the purposes of the Order to be taken as £50 for a horse and £12 for an ass or mule. In approving these rates of compensation the Board have kept in view the importance of securing the co-operation and support of horse-owners in the operations to be undertaken.

The new Order requires Local Authorities to destroy not only horses, asses, and mules which show clinical symptoms which are definite evidence of disease, but also those in which the application of the mallein test has resulted in definite evidence of disease. All such animals are for purposes of the Order to be treated as "diseased" animals, and a "suspected" animal is defined as one which shows clinical symptoms of glanders, but such as are insufficient to make the animal "diseased." Animals which have merely been in contact with diseased animals are not necessarily on that account to be treated as "suspected," but special provision is made for the treatment of animals which can fairly be regarded as having been exposed to infection.

The adoption of the mallein test as a basis of diagnosis affords, the Board believe, a means whereby the entire eradication of glanders from this country may within a reasonably short period of time be secured, and the provisions of Article 2 of the Order are designed to minimise the risk of re-importation of the disease by means of animals brought from abroad.

Much will depend, however, upon the manner in which the Order is carried out in various districts, and, with a view to secure the greatest attainable amount of administrative uniformity and efficiency in the important duties entrusted to veterinary inspectors of Local Authorities, the Board desire to call the special attention of Local Authorities to the following points.

The application of the mallein test is an operation which must be conducted by skilled veterinarians and with the utmost care, and confidence cannot be placed in the result unless reliable mallein from proved sources only is used for the purpose of the test. Inasmuch as many preparations of

mallein may come into the market, some of which may be unproved, the Board will be willing to advise Local Authorities regarding those proved after numerous trials to be reliable. Directions as to the best methods of applying the test for the purposes of the new Order are given below (see p. 424).

As regards the results of the mallein test the Order [Article 7 (5)] provides for three eventualities: (*a*) "definite evidence of disease," which will be followed by immediate slaughter; (*b*) "indications of the disease not amounting to definite evidence of disease," which will be followed by a second test within twelve days; and (*c*) cases in which the original application results in no indications of disease, or in which the second application does not result in definite evidence, in which cases the animals will cease to be subject to restrictions imposed by the Order at the expiration of 48 hours after the application of the test. The respective meanings which the Board intend to express by the phrases "definite evidence of disease" and "indications of the disease not amounting to definite evidence of disease" are set out in the directions as to applying the mallein test.

The Order [Article 7 (3)] requires that the Local Authority shall exercise the power of serving the owner with a notice restricting movement in the case of every horse, ass or mule which has, in the opinion of the Local Authority, been exposed to the risk of contagion of glanders. Where a notice of the kind has been served, the Local Authority are under an obligation to apply the mallein test at once to the animals, after being requested by the owner to do so [Article 7 (4)]. It is evident, therefore, that the question of the meaning to be attached to the expression "exposed to the risk of contagion" assumes considerable importance, and it is thought that Local Authorities would be well advised in issuing instructions for the guidance of their veterinary inspectors, on whom will fall the responsibility of deciding whether or not a particular animal can fairly be considered to have been in contact with a dangerously diseased animal.

The Board are advised that where clinical evidence of glanders or of farcy is present, every horse, ass or mule that has been stabled in juxtaposition to the diseased animal, or which has been tended by the same individual or watered

from the same trough as the diseased animal at any period since it became affected with glanders or farcy, must be regarded as having been exposed to the risk of contagion. Similarly, where stable utensils, rugs, harness, &c., are used indiscriminately for horses in the same stud, a risk of contagion has clearly been incurred by all the animals in the stud. In the case of very small studs kept in confined premises, it will generally be wise to assume that all the animals have been exposed to such risk. Where, in the absence of clinical signs, the presence of disease has been established through the agency of the mallein test, the question of dangerous contact becomes more difficult to decide. In spite of the fact that disease was not clinically apparent, the lesions found at the autopsy may be of such a character as would have rendered the animal capable of transmitting the disease to an extent equal, or almost equal, to a clinically affected animal. When slaughter is resorted to, the veterinary inspector will often be able to obtain a good idea of the measure of such risk from the *post mortem* appearances revealed. Should slaughter for any reason be deferred, the precautions to be taken should, in the opinion of the Board, be those suggested in clinical cases.

Where the number of horses to which the mallein test is to be applied is considerable, and the temporary throwing out of work of the whole of them at one time would tend to dislocate the business of their owner, it will probably be found convenient for the Local Authority to arrange in agreement with the owner for the testing of them in batches on different days. Such an arrangement could be carried out under Article 7 of the Order, the use of the horses for business purposes during the interval elapsing between the service of the notice and the application of the test being provided for in conditions incorporated in the notice, including the requirement that the horse to which the notice applied shall only be removed from the stable for the purpose of the necessary business of the owner, and be returned daily to the premises without being stabled on any other premises.

It is very advisable that, prior to slaughter, steps should be taken to ascertain the value of the animal. Provision is made for the ascertainment of value for compensation in the Animals (Transit and General) Amendment Order of 1904—

as regards England and Wales in Article 13, and as regards Scotland in Article 14, of that Order. It is also of importance that full notes should be made of the history of any animal reacting to the mallein test, *prior to its slaughter*, and that means should be taken to secure the identification of each animal after death, so that, where necessary, the movements of such animal during its life-time can be traced without any risk of confusion. It will probably be found convenient that such information should be obtained and carefully recorded at the time that the mallein test is applied.

The slaughter of an animal reacting to the mallein test is to be followed by a *post mortem* examination conducted by the veterinary inspector of the Local Authority of which due notice is to be given to the owner of the slaughtered animal, who is entitled [Article 9 (1)] to be present at such examination in person, or by a representative, who, if the owner thinks fit, may be a veterinary surgeon. The veterinary inspector is required to communicate the result of his examination to the owner or his representative at its conclusion, and the inspector's decision as to the presence or absence of disease is final, except only where a veterinary surgeon, acting on behalf of the owner, disputes the inspector's decision, in which case an appeal lies to the veterinary officers of the Board, whose decision is final [Article 9 (3) and (4)].

It appears very desirable that the compensation due to the owner on the scale prescribed in Article 10 of the Order should be paid as soon as possible after the completion of the veterinary examination, in respect of each animal slaughtered, except only in respect of any particular animal or animals as to which an appeal has been lodged. In the case of animals which are the subject of such appeal, the amount of compensation payable cannot be decided until the result of the laboratory investigations which will be undertaken by the Board's veterinary officers is known, and a period of some weeks may elapse before the necessary decision can be made. It would be well that the owner should be apprised of this fact by the veterinary inspector when communicating to him the result of the *post mortem* examination.

The Board have carefully considered the suggestion that has been made to them that the Order should require the

closing of all public water troughs as a precaution against the spread of glanders, but they have been advised that there is not sufficient evidence forthcoming to indicate that the closing of such troughs generally is reasonably necessary in order to prevent the spread of the disease, a condition which must necessarily exist before they could under their existing powers take such action. The Board think, however, that Local Authorities would do well to keep this matter in view, as in some cases they may themselves have power to act, apart altogether from the Diseases of Animals Acts, and the enforcement of such a power might in certain circumstances be very advisable.

The Board trust that Local Authorities throughout Great Britain will co-operate heartily with them, in a sustained endeavour to eradicate glanders from this country, by making arrangements for the administration of the new Order on the lines above indicated. There seems little doubt but that the disease has hitherto been to a large extent kept alive by animals suffering from the disease in an occult form. The mallein test supplies a weapon by means of which occult disease may be detected, and if adequate steps are taken to trace all animals which have within a reasonable period been in contact with dangerously diseased animals, the occult cases should by the application of the test soon be brought to light, and unsuspected centres of disease be detected. The necessary expenditure may, in the first instance, be materially increased, but, if the considerations upon which the Order is based are sound, the result aimed at should be secured within a comparatively short period, whereupon annual recurring expenditure of public monies in connection with this disease would, it is confidently hoped, become a thing of the past.

The directions for applying the mallein test referred to in the above circular are as follows:—

Directions as to Applying the Mallein Test.

As far as possible avoid applying the test to animals with a temperature which is distinctly above the normal, and the operations should be carried out under strict antiseptic conditions.

A large stock of mallein should not be purchased for storing, as there is a

greater guarantee of purity if it be ordered fresh from the laboratory. It can always be obtained at short notice. Cloudy mallein should not be employed. The injection should be made into the subcutaneous tissue of the neck, about six inches anterior to the shoulder. During the test the animal should be kept in the stable.

1. *Definite Evidence of Disease.*—(*a*) A reaction is typical, and may for all practical purposes be considered "definite evidence of disease" when the temperature rises from the normal to above 103° Fahr. at the sixth, ninth, twelfth, eighteenth, or twenty-first hour, and the rise of temperature is accompanied by a painful local swelling which persists and increases during 48 hours and by symptoms of severe systemic disturbance, such as loss of appetite, stiffness of gait, and hurried breathing. It should be noted, however, that the severe systemic disturbance may very often be absent in horses which are undoubtedly glandered, and one may with small risk of error accept the rise of temperature accompanied by the local swelling as conclusive evidence of glanders. The swelling, however, must persist for 48 hours or more, and to be accepted as definite it should measure five inches or more in diameter. Animals reacting in this manner may be considered glandered without further test. If the swelling is not typical it will probably have disappeared by the twenty-fourth or thirtieth hour.

(*b*) Should it be found necessary to test a horse with a temperature slightly above the normal, a rise of temperature with a typical local swelling may for all practical purposes be taken as definite evidence of glanders.

2. *Indications of Disease not amounting to Definite Evidence of Disease.*—(*c*) If the temperature rises distinctly—two or three degrees or more—starting from the normal, or slightly above the normal, and the local swelling is not typical, the animal should be tested again. It is not advisable to apply the second test to an animal whose temperature is even slightly above its normal.

(*d*) When the test is applied to an animal with a normal temperature, it may very occasionally happen that, although the febrile indications are insignificant, the local swelling is typical. Such animals will generally be found to be glandered; but it is advisable to test them a second time.

(*e*) When the temperature rises two or three degrees or more, starting from the normal, or slightly above the normal, and no local swelling appears, the animal is generally free from glanders; but it is advisable to resort to a second test, unless the veterinary inspector is satisfied that the febrile disturbance is accounted for by other causes than glanders.

(*f*) As stated in the Order, the second test must be applied within twelve days. It should not be applied earlier than ten days after the first test, and it is advisable to employ a larger dose of mallein (say, a dose and a half) for the second.

(*g*) Should clinical symptoms of glanders appear in the interval before a second test would fall to be made, the second test will be unnecessary.

Samples of Butter Analysed in 1906-07.

The report of Dr. Thorpe upon the work of the Government Laboratory (Cd. 3603, Price $3\frac{1}{2}d.$) shows that the number of samples analysed in connection with the Board of Agriculture and Fisheries in the year ended 31st March, 1907, was 2,429, of which 1,842 were samples of imported butter taken at the ports by officers of the Board of Customs.

As regards 18 of the samples there was conclusive evidence of adulteration with foreign fat, while 21 other samples gave results which threw considerable suspicion upon the purity of the butter, although not sufficiently conclusive to warrant proceedings being taken against the importers. In 30 samples, including two of those where foreign fat was present, the butter contained water in excess of the limit fixed by the Regulations of the Board of Agriculture and Fisheries.

In 46 cases the results were reported to the Commissioners of Customs for consideration with a view to legal proceedings, and in 30 cases the importers were convicted and fined at hearings before magistrates. The remaining cases were either *sub judice*, or for various reasons, as for example the re-exportation of the goods, had not been proceeded with.

The legal proceedings in respect to certain samples of butter examined in the year 1905-06, which were in progress at the time of the last annual report, have been concluded. In several cases convictions were obtained and substantial

penalties imposed. The result of the proceedings which the Commissioners of Customs considered it their duty to undertake has been a great improvement in the character of the butter imported from certain quarters on the Continent.

Apart from imported dairy produce, a number of samples, mainly of butter and butter adulterants, were obtained from various sources.

Certain of the samples related to the materials used by a "scientific" butter adulterator, who offered for sale his process for manipulation of butter. He was subsequently prosecuted, and committed for trial on charges for inciting to commit a felony, but failing to appear, his bail of £800 was estreated.

Other samples were butter coming from a particular creamery, and found on examination to be adulterated. On the strength of the evidence furnished by the Laboratory report, search warrants were granted by magistrates, and the entire process of the adulteration of the butter was found in operation on the creamery premises.

Dairymen and Sources of Milk Supply.

Sections 53 and 54 of the Public Health Acts Amendment Act, 1907, which comes into operation on 1st January, 1908, contain provisions affecting dairymen in connection with cases of infectious disease. Section 53 provides that (1) if the medical officer certifies to the local authority that any person in the district is suffering from infectious disease which the medical officer has reason to suspect is attributable to milk supplied within the district, the local authority may require the dairyman supplying the milk to furnish to the medical officer within a reasonable time fixed by them a complete list of all the farms, dairies, or places from which his supply of milk is derived or has been derived during the last six weeks, and, if the supply, or any part of it, is obtained through any other dairyman, may make a similar requisition upon that dairyman; (2) the local authority shall pay to the dairyman for every list furnished by him under this section the sum of 6*d*., and, if the list contains not less than twenty-five names, a further sum of 6*d*. for every twenty-five names contained in the list; and (3) every dairyman shall comply

with the requisition of the local authority under this section, and, if he fails to do so, shall be liable in respect of each offence to a penalty not exceeding £5 and a daily penalty not exceeding 40*s*.

Section 54 states that (1) every dairyman supplying milk within the district of the local authority from premises whether within or beyond the district aforesaid shall notify to the medical officer all cases of infectious disease among persons engaged in or in connection with his dairy as soon as he becomes aware or has reason to suspect that such infectious disease exists; and (2) any dairyman who shall fail to comply with this section shall for every such offence be liable to a penalty not exceeding 40*s*.

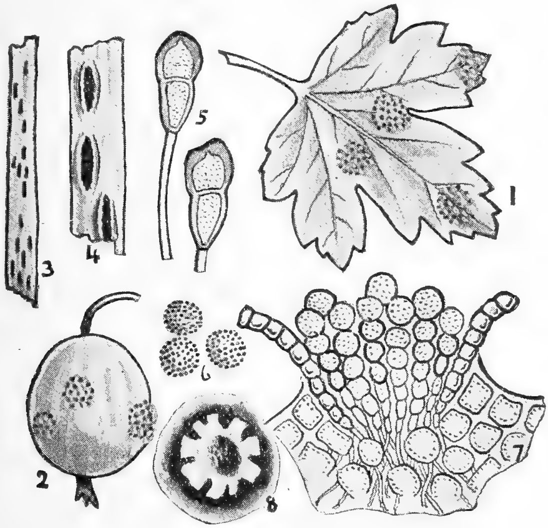
Gooseberry "Cluster-Cup" Disease.

This disease (*Puccinia pringsheimiana*, Kleb.) is one of those sporadic diseases which are present during certain seasons in considerable abundance, and then entirely disappear for years. This behaviour on the part of many parasitic fungi is at present inexplicable; there is no reason for suspecting climatic conditions to be the cause, and the requisite host-plants are equally available every season.

The fungus forms bright orange patches on the leaves and fruit, the patches eventually being covered with minute cup-like bodies with white fringed edges and filled with orange-coloured spores.

It has been proved that other stages in the life-cycle of the gooseberry cluster-cup grow on living leaves of sedges (*Carex*), appearing under the form of minute brown or blackish streaks resembling in general appearance wheat rust (*Puccinia graminis*, Pers.). The winter spores produced on sedge leaves infect gooseberry leaves and fruit, and give origin to the "cluster-cup" form of fruit. Although this is undoubtedly true in some instances, the fact that "cluster-cups" appear on gooseberry bushes growing in gardens far removed from the vicinity of sedges, suggests that under certain conditions the "cluster-cup" condition can directly reproduce itself without the intervention of another form of the fungus, as has been proved to be the case with other rusts.

The disease rarely assumes the proportions of an epidemic, and the most satisfactory method of arresting its spread is by collecting and burning infected leaves and fruit.



GOOSEBERRY "CLUSTER-CUP" DISEASE.

1.—"Cluster-cups" on gooseberry leaf (nat. size); 2.—"Cluster-cups" on fruit (nat. size); 3.—Rust stage of fungus on leaf of sedge (nat. size); 4.—Same as fig. 3 (slightly magnified); 5.—Winter spores produced on sedge leaf (highly mag.); 6.—Summer spores from sedge leaf (highly mag.); 7.—Section of a "cluster-cup" (highly mag.); 8.—Surface view of a "cluster-cup" (slightly mag.).

Sedges growing in the vicinity of gooseberry bushes should be cut in the spring, before the winter form of the rust matures on the leaves.

Changes in Wages of Agricultural Labourers in 1906.

According to a report in the *Labour Gazette* (August, 1907), the rates of wages of farm labourers in England and Wales in 1906 were on the whole slightly above those paid, in 1905, though in the great majority of rural districts there was no change. The increases were reported chiefly from the Midland and South-Western Counties in England, and from Wales.

In the following table the changes in wages disclosed by the returns are given in combination with the estimated number

of agricultural labourers in the rural districts affected.* The corresponding figures for the ten years 1896 to 1905 are added for comparison:—

Year.	Estimated Total Number of Labourers in Districts in which the Predominant Rates of Wages—		Computed Amount of Change in Aggregate Weekly Cash Wages of the Labourers in Districts Affected.		
	Increased.	Decreased.	Increase.	Decrease.	Net Increase (+) or Decrease (−).
	No.	No.	£	£	£
1896	52,721	36,676	1,858	1,513	+ 345
1897	72,559	4,340	2,232	110	+ 2,122
1898	183,987	2,356	6,227	47	+ 6,180
1899	163,960	208	5,438	4	+ 5,434
1900	230,635	...	8,150	...	+ 8,150
1901	127,565	10,469	3,559	398	+ 3,161
1902	51,949	41,705	1,609	1,297	+ 312
1903	51,095	24,953	1,449	893	+ 556
1904	23,779	9,569	1,032	451	+ 581
1905	6,659	12,438	252	442	− 190
1906	14,758	8,744	704	322	+ 382

The figures show that in the period 1897 to 1901 there was a decided upward tendency in agricultural wages. In the following years, 1902 to 1904, and in 1906, the upward movement was much less marked, while in 1905 there was a very slight downward tendency.

In districts for which returns have been received the estimated number of agricultural labourers whose wages were reported to have changed in 1906 was 23,502, while the number whose rates of wages were reported as unaltered was 382,203. Of the 23,502 labourers whose wages were changed, 14,758 were in districts where wages were increased, and 8,744 in districts where wages were reduced.

The estimated net increase in 1906, in the districts in which changes were reported, amounted to a total rise of £382 per week in the wages of those affected, as compared with a fall of £190 per week in 1905.

* Further particulars respecting the method of computing changes in agricultural wages are given in "Report on Changes in Wages and Hours of Labour." Cd. 3172, 1906. Wyman & Sons, Ltd. Price 7d.

Returns have also been received from 174 correspondents in England which afford some indication of the course of agricultural wages in the present year. The returns give a comparative statement of the rates of wages most generally paid to ordinary agricultural labourers in June, 1907 and 1906, in the Poor Law Unions in which the correspondents reside. Of the 174 returns, 161 show no change between the two periods, 7 show an upward tendency, and 6 a downward tendency (5 from Southern Counties).

Scotland.—Information as to the rates of wages agreed upon at hiring fairs in Scotland was obtained by the Department from a correspondent who made special inquiries on the subject.

The correspondent reported that at the hirings held in 1906 wages of male farm servants varied but slightly compared with those agreed upon at the corresponding hirings of 1905. There was, however, a downward tendency in a few districts in the north, north-east, and centre, though the reduction in wages applied chiefly to some of the men who changed situations. Men who remained in their old places generally obtained the rates of wages previously paid. In no part of the country was there any serious scarcity of men, and the hirings were generally fairly well attended. Women remained scarce, however, and their wages firm, in some cases showing an upward tendency. Men with wives, or other women workers in their families, were always in good demand. In some districts of Ayrshire the long continued scarcity of dairymaids has led to men being more largely employed in cheese-making.

Rental of Farms in Scotland.

A return (H.C. 127) has been presented to the House of Commons showing the number of occupiers of farms (whether owners or tenants), in each county and parish in Scotland, with the gross rental according to the valuation roll, for the year ending at Whitsunday, 1906:—An explanatory note prefacing the return states that it includes (1) occupiers of lands used for any farming purposes, whether with or without a house; (2) occupiers of glebe used

for any farming purpose; and (3) occupiers of all lands used for dairy-farming; and that it excludes (1) occupiers of lands used only for market or nursery gardens; and (2) parks occupied by butchers and others for merely temporary grazing, and not for farming.

Any occupier of more than one farm situated in the same parish is returned only once, and as occupier of land of the aggregate value of the total rental of such farms. Where there are joint occupants of one and the same farm they are returned as one occupier.

Gross Rental according to the Valuation Roll for the Year ended Whitsunday, 1906.	Total.	
	Number of Persons.	Gross Rental as per Valuation Roll.
		£ s. d.
At 1*l*. and under	3,863	2,897 7 5
Over 1*l*. and at or under 2*l*.	6,829	11,152 6 3
,, 2*l*. ,, ,, 3*l*.	6,871	18,076 16 2
,, 3*l*. ,, ,, 4*l*.	5,779	21,092 0 11
,, 4*l*. ,, ,, 10*l*.	17,500	116,843 0 10
,, 10*l*. ,, ,, 15*l*.	6,356	80,367 9 8
,, 15*l*. ,, ,, 20*l*.	4,071	72,272 7 9
,, 20*l*. ,, ,, 30*l*.	4,938	124,486 13 4
Total not over 30*l*.	56,207	447,188 2 4
Over 30*l*. and at or under 40*l*.	3,359	118,997 14 6
,, 40*l*. ,, ,, 50*l*.	2,737	124,635 2 7
Total over 30*l*. and not over 50*l*.	6,096	243,632 17 1
Over 50*l*. and at or under 60*l*.	2,309	128,074 3 4
,, 60*l*. ,, ,, 70*l*.	2,148	140,492 15 9
,, 70*l*. ,, ,, 80*l*.	1,970	148,665 17 9
,, 80*l*. ,, ,, 90*l*.	1,676	142,748 9 3
,, 90*l*. ,, ,, 100*l*.	1,551	148,030 17 2
,, 100*l*. ,, ,, 150*l*.	6,022	744,271 19 3
,, 150*l*. ,, ,, 200*l*.	3,730	645,072 16 9
,, 200*l*. ,, ,, 300*l*.	3,846	932,063 3 4
,, 300*l*. ,, ,, 400*l*.	1,629	559,625 14 8
,, 400*l*. ,, ,, 500*l*.	858	381,666 15 8
,, 500*l*. ,, ,, 750*l*.	768	455,632 18 1
,, 750*l*. ,, ,, 1,000*l*.	172	143,458 4 7
,, 1,000*l*. ,, ,, 1,500*l*.	75	89,342 13 1
,, 1,500*l*. ,, ,, 2,000*l*.	5	8,328 8 3
,, 2,000*l*. ,, ,, 2,500*l*.	2	4,219 1 6
,, 2,500*l*. ,, ,, 3,000*l*.	1	2,959 9 11
,, 3,000*l*.	—	—
Total over 50*l*.	26,762	4,674,653 8 4
Grand Total	89,065	5,365,474 7 9

Persons Engaged in Agriculture in Different Countries.

According to a reply made by the President of the Board of Trade to a question in the House of Commons, the following statement shows the total number of persons engaged in agriculture and of agricultural labourers in the undermentioned countries and years, according to the respective censuses of occupations :—

The occupations included under the term agriculture vary in the census reports for the different countries.*

Country.	Occupations Included.	Date of Census.	Persons Engaged in Agriculture.	Agricultural Labourers.
Germany	Tillage of soil, stock raising, vegetable, fruit, vine, and tobacco cultivation, dairying	1895 1882	8,045,441 8,063,966	5,445,924 5,763,970
France ...	Tillage of soil, threshing, market gardening, mushroom growing, dairying	1901 1896	8,100,000 8,430,000	3,565,600 4,022,000
Austria ...	Tillage of soil, raising of farm stock, gardening	1900 1890	8,113,758 8,394,638	5,941,275 6,379,085
Hungary	Tillage of soil, stock raising, poultry farming, dairying, market gardening, horticulture	1900 1890	4,916,008 4,459,712	3,368,996 2,836,743
Italy ...	Tillage of soil, cultivation of fruits, tobacco growing, stock raising, poultry and bee keeping, mushroom growing, forestry and woodcutting.†	1901 1882	9,611,003 8,566,467	4,156,753 Cannot be stated.
Spain ...	No information available.			

* According to the Census returns of the United Kingdom, the number of persons engaged in agriculture (10 years of age and upwards) was 2,262,454 in 1901 and 2,420,926 in 1891.

† Forestry workers and woodcutters, which are included in the Italian figures, but not in the totals for other countries, numbered 44,663 in 1901 ; the corresponding figure for 1882 cannot be stated.

Circular relating to the Small Holdings and Allotments Act, 1907.

In connection with the Small Holdings and Allotments Act, 1907, the Board of Agriculture and Fisheries have addressed the following circular, dated 30th September, to the Clerks of County Councils and County Boroughs in England and Wales :—

SIR,

I am directed by the Board of Agriculture and Fisheries to inform you that the Small Holdings and Allotments Act, 1907, comes into operation on the 1st January, 1908, and that, in view of the very important and extensive powers which it gives to County Councils, the Board would suggest that your Council should consider at an early date what steps should be taken to carry out the provisions of the Act in their county.

There are many matters of detail connected with the Act which are receiving the careful consideration of the Board, and as to these, communications will be addressed

to you from time to time, but the Board think it desirable to call the attention of your Council at once to the fact that the Act provides that County Councils may themselves take the initiative in preparing a draft scheme or schemes for the provision of small holdings for their county.

At a later period the Board hope to be in a position to nominate officers to confer with your Council as to the administration of the Act, but they would suggest in the meantime that your Council should at once set on foot preliminary inquiries as to the extent of the demand for small holdings in their county, and as to the possibility of satisfying those demands by the acquisition of suitable land either within or without the county. The Board are of opinion that these preliminary inquiries should be as little formal as possible, and they think that no better method could be adopted than to invite the individual members of the Council to interest themselves in the matter by making informal inquiries in their respective districts.

It will also be necessary that the provisions of the Act should be made known to the class who are likely to take advantage of it, and in this connection I am to observe that experience has shown that very useful information is often obtained by the insertion in the local newspapers of advertisements, framed in simple language, inviting applications from men who desire land for small holdings, and requesting applicants to forward particulars as to the quantity of land desired, the locality preferred, the extent of their experience in agriculture, and the amount of their capital. With this information in their possession your Council would be in a position to consider the steps to be taken to satisfy the demand so soon as the Act comes into operation.

I am further directed to call the attention of your Council to the fact that the small holdings provided by County Councils under the Act of 1892 have in no case resulted in any charge being placed on the rates of the county, and that where small holdings are provided under the Act of this year the possibility of any such charge arising has been very considerably diminished. Under section 17 of the Act the Board are authorised, subject to regulations to be made hereafter by the Board with the approval of the Treasury, to repay to County Councils the whole or any part of the expenses incurred by a Council in relation to the acquisition of land for the purposes of small holdings (other than the purchase money, or any compensation, or rent payable in respect of the land), and in pursuance of section 14 of the Act, the term for the repayment of loans for the purchase of land may be extended to 80 years, and County Councils will be able to borrow from the Public Works Loans Commissioners on favourable terms. In addition, in cases in which the carrying out of a scheme under the new Act has resulted or is likely to result in a loss, one-half of that loss will be borne by the Exchequer, subject to certain conditions, which will be set out in a Treasury Minute to be subsequently issued.

I am to add that the expression "County Council" in the Act of 1892 and in the new Act includes the Council of a County Borough.

Copies of the new Act are now obtainable, either directly or through any bookseller, from Messrs. Wyman and Sons, Ltd., Fetter Lane, London, E.C.

I shall be glad to forward to you additional copies of this circular on application.

I am, &c., T. H. ELLIOTT, *Secretary.*

The general summary of the Reports of the Crop Estimators of the Board issued on the 23rd September, is as follows:—

Reports on Crop Prospects, September, 1907.

Since the last Report the weather continued cold for a while, but the first fortnight of September has generally been fine and dry, with more warmth to ripen the crops, and some improvement may accordingly be noted. Generally the prospects are best in the south, and the north has been less favoured, although it can hardly be said that the Scotch crops as a whole are below average.

All three cereals show some improvement during the month, and generally the tenour of the comments of the Board's Crop Estimators seems to indicate a much greater improvement than is shown by their estimates of the prospective yield of the crops. Wheat is now regarded as just over average, barley as average, and oats well above average; the latter being, as noted in August, much the best of the corn crops. The quality, however, generally leaves much to be desired, and the statements to this effect are corroborated by reports from the markets of the condition of the new corn.

Potatoes have seriously deteriorated during the month. This crop, unlike others, is worse in England than in Scotland; there is much more disease in the south, but in the north on the other hand some damage seems to have been done by early September frosts.

Roots have somewhat deteriorated during the month; this applies more particularly to the north, and especially to Scotland; in Divisions I. and II. of England there has been on the other hand an improvement. There is considerable complaint of their running to seed; nevertheless, the prospects as a whole are distinctly above average.

The hay crop generally has been a bulky one, and partly owing to the northern crops being rather better than was anticipated, and partly to reports of good second crops in most districts, the position is regarded as even slightly better than was recorded in August.

The prospects of the hop crop have not improved since the last report; and, although the quality is generally described as good, the yield appears likely to be below average.

There are few complaints of scarcity of labour, and the supply seems generally adequate. More manual labour than in recent years has been necessary owing to the difficult nature of the harvest.

Summarising the reports, and representing the prospect of an average yield in each case by 100, the appearance of the crops in mid-September may be represented, for Great Britain as a whole, by the following percentages:—Wheat, 101; barley, 100; oats, 105; potatoes, 93; roots, 102; and hay, 108.

Notes on the Weather and the Crops in September.

The improvement in the weather which occurred in the latter part of August was interrupted in the *first* week in September, and the weather again became unsettled, with rather frequent, but not generally heavy, rain in all parts of the kingdom. Temperature was below the average, and bright sunshine was also deficient.

In the *second* week, however, the weather was very fine and bright over Great Britain, and the temperature was above the average, warmth being returned as "unusual" in all districts except Scotland E. Bright sunshine was also "abundant," and in some districts "very abundant."

The *third* week was again almost entirely rainless, and generally very bright. The temperature exceeded the average except in England S., warmth being again returned as "unusual" in most districts. Sunshine varied from "very abundant" to "moderate," but exceeded the average in all districts except Scotland W.

The weather in the *fourth* week of September continued fine until nearly the close of the week, when it became less settled, and several parts of the Kingdom experienced a little rain. Temperature continued above the average, "unusual" warmth being recorded over the whole of the eastern section of the British Isles, and "very unusual" warmth over the whole of the western section. Bright sunshine exceeded the normal over England and Scotland N., but was below it elsewhere.

The casual notes which are received on the crops in different districts show that the fine weather experienced in September had a good effect. From Lancashire it is reported that harvesting had proceeded uninterruptedly during the month, and the

laiger part of the harvest was secured. Good aftermaths of hay have been obtained. Potato disease has not increased, and the tubers are turning out better than was expected. In Berkshire, however, potatoes are reported as much diseased and yielding badly. The harvest was got in in good condition. In Argyllshire oats were being cut as weather permitted. Turnips and potatoes varied from good to very bad, according to whether they were planted early or late. Sheep in good condition. Some hay uncut and but little carted home as yet.

Notes on Crop Prospects Abroad.

World's Oat Crop.—According to *Dornbusch*, 6th September, the Hungarian Minister of Agriculture estimates this year's world's oat crop at 395,069,000 qrs., as compared with 391,222,000 qrs., the yield of 1906.

France.—The report of the Minister of Agriculture on the approximate state of the wheat harvest was published in the *Journal Officiel* of 21st September. The total area sown is estimated at 16,126,300 acres, and the produce at about 46,600,000 qrs. compared with 16,096,400 acres and 41,100,000 qrs. in 1906.

Argentina.—In *Dornbusch's* List of 20th September it is stated that the final report of the Minister of Agriculture estimates the wheat crop at 19,527,000 qrs., which is rather under earlier estimates.

Canada.—According to a report in the *Canadian Horticulturist* (September), indications then pointed to an apple crop in Canada much below early predictions. The yield of early varieties is stated to be much below the average. The demand is good, as in many districts early and fall apples are scarce. An average crop of winter apples is expected, with quality good. So far the orchards, with some exceptions, had been remarkably free of pests. Growers were confident of securing good prices during the coming season.

Germany.—The official report on the condition of the crops in the middle of September shows that potatoes were 2·6, the position being the same as in the previous month, the figure for the corresponding date last year being 2·8. Potatoes are worst in Northern and North-Eastern Germany, while in Central Germany the tubers are somewhat small. In the Rhine Country and Southern Germany a good harvest may be expected. Owing to the much belated corn harvest and the great wetness of the soil the autumn work is much set back in Prussia. Field mice are present in unusual numbers in different parts of the country, and are doing considerable damage.

Hungary.—According to the official report of the Ministry of Agriculture in the middle of September the yields of wheat, barley, oats, and maize are estimated as follows:—Wheat, 63,800,000 cwts.; barley, 27,500,000 cwts.; oats, 23,600,000 cwts.; and maize, 86,200,000 cwts. In the case of wheat there is a falling-off of more than one-third compared with last year, while there is a dcreasee in barley and oats. Maize, however, shows a rise of 4,700,000 cwts.

Austria.—According to a report in *Dornbusch's* List of 19th September, the Ministry of Agriculture reported that about mid-September winter wheat had turned out a fairly good crop, but winter rye had been less satisfactory. The development of maize was partly retarded by unfavourable weather. Potatoes promised well.

Italy.—A note in *Dornbusch's* List of 6th September states that an official report of 20th August estimates this year's grain crop at 52,000,000 hectolitres (18,000,000 qrs.), or 10,000,000 hectolitres below last year.

Russia.—According to a despatch dated 30th September, forwarded to the Foreign Office by Mr. Ernest Scott, this year's harvest in Russia may on the whole be said to be an average one. There is a sufficient quantity of grain for home consumption and for sowing purposes, and there is an average surplus for export. Winter wheat is not altogether satisfactory, but the spring wheat crop is generally normal. The districts in which it is unsatisfactory are comparatively unimportant in extent. The barley crop in European Russia is rather better than usual, but of the principal cereals, oats

did best of all and yielded a good crop in a very large district. The quality of the grain generally is better than was expected and even the winter crops recovered largely from the unfavourable weather which prevailed in the early part of the year.

Miscellaneous Notes.

Lights on Vehicles Act, 1907.—The Lights on Vehicles Act, 1907, requires that any vehicle on a public highway between one hour after sunset and one hour before sunrise shall be provided with a lighted lamp or lamps in proper working order, so constructed and attached as to display to the front a white light visible for a reasonable distance. If only one lamp is provided, it shall be placed on the off or right side of the vehicle, and, if the lamp or lamps are so constructed as to permit a light to be seen from the rear, that light shall be red. If the vehicle is used for carrying timber or any load projecting more than six feet to the rear, a lighted lamp or lamps shall be carried so as to display to the rear a red light visible for a reasonable distance. Section 4 provides that the council of any county may, by order, exempt from the operation of the Act vehicles carrying in the course of harvesting operations any farm produce to stack or barn during such months or periods in the year as may be specified in the Order, and any such Orders may be made either to take effect throughout the whole county or to take effect in part only of the county. The Act comes into force on 1st January, 1908.

International Seed-Testing Conference.—The report of the 1st International Conference on Seed-Testing, which was held at Hamburg from 10–14th September, 1906, has now been published. Reports were made by Dr. Stebler, of the Zürich Seed-Control Station, on the means of ascertaining the origin of seeds; by Professor Rodewalde, of Kiel, on estimating the purity of seeds; and by Dr. A. von Degen, of Budapest, on the question of clover dodder, while other speakers addressed the Conference on various subjects of interest in connection with seed control.

Dr. Stebler quoted a case of a clover sample badly infested with weed seeds, 550 grams weight of the sample containing, amongst other weed seeds, no less than 4,500 seeds of *Plantago lanceolata,* 2,240 seeds of *Daucus carota,* 1,140 seeds of *Cichorium intybus,* and 151 seeds of *Cuscuta trifolii* (clover dodder). From its contents it was decided that this sample had been derived from central France.

Considerable attention was directed to dodder and a resolution was passed to the effect that the representatives of the various stations there assembled should urge their governments to submit proposals for the extermination of dodder, and that the stations should collect and publish the existing enactments on the subject.

Association in Denmark for the Prevention of Tuberculosis.—An agricultural association, called the Tuberculin Association, has been started, the aim of which is to increase the interest in the acquisition and maintenance of herds of cattle and swine free of tuberculosis. In September, 1906, the association had 105 members, owning 2,300 cows. To be a member it is necessary that the farmer should have his live stock tested with tuberculin, and that this live stock should be found sound, or partly sound. In the latter case, it is required by the association that the sick animals should be effectively isolated from the sound, in the manner prescribed by the society. A member of the association is chosen as president for a year, and it is incumbent upon him to keep an account of sound animals which have been bought or sold, and he gives advice to members who wish to buy or sell their animals.—*F.O. Report, Annual Series, No.* 3862.

Extermination of Rats in Denmark.—A law relating to the extermination of rats has been passed, and the Danish Government has allocated the sum of £4,276, to be used during three years for this purpose. It is, however, on condition that an organization, which has already been formed for the extermination of rats, shall spend an amount of £1,666 during the three years for the same purpose. This Bill was before the Rigsdag several years ago, and at that time it was proposed that the mone

should be spent in premiums of 10 öre ($1\frac{1}{3}$d.) for every rat killed and produced. In the meantime, however, a patent rat destroyer has been invented in Denmark, called Ratin, which is stated to be fatal to rats, whereas it may be taken by human beings, dogs and poultry without danger. In the law it is stipulated, therefore, that part of the grant shall be used on the Government properties and domains in experimenting with Ratin and other remedies which may be found suitable.—*F.O. Report*, *Annual Series*, *No.* 3862.

Disinfection of Hides Imported into the United States.—A circular issued on 18th July last by the Treasury Department at Washington provides that no hides of horses or cattle, except dry hides which have been arsenic cured, shall be imported into the United States unless a certificate, signed by the American consul at the place from which exported, be produced showing that such hides were disinfected prior to shipment by immersion in a 1 to 1000 solution of bichloride of mercury until thoroughly wet with such solution, and kept immersed for not less than thirty minutes.

Exhibition of Industry, Agriculture, &c., at Saragossa.—The Bulletin Mensuel of the French Chamber of Commerce at Barcelona for June–July contains a notice to the effect that the town of Saragossa is organising for next year an international exhibition, the sections of which will comprise the following:—(1) Agriculture; (2) Foodstuffs; (3) Industry; (4) Chemical industry; (5) and (6) Art; (7) Educational Material, Books; (8) Social Economy; (9) Hygiene; (10) Various Industries. (*Board of Trade Journal*, 5th September, 1907.)

Agricultural Machinery in Italy.—H.M. Consul-General at Naples (Mr. E. Neville-Rolfe, M.V.O.) reports that the ordinary corn crops of the United Kingdom grow abundantly in the plains round Foggia, and it is there that the trade in agricultural implements is centred. The pioneers in this business were a British firm, since turned into an Italian company under British management, whose business extends all over the province of Bari. Considerable competition has come in from other nations, reapers being almost entirely of the American patterns, and ploughs and harrows largely of German and American make. With the exception of some machines for olive crushing and wine pressing, which are made by a local British firm, such machines are largely made in France, and where turbines are used for the harnessing of water power they are chiefly imported from Switzerland. "There is plenty of room," adds Mr. Rolfe, "for the expansion of British trade in machinery, and it is somewhat surprising to relate that the splendid grass crops at Carditello (a Royal domain near Naples) were in the spring of 1907 mown by hand instead of by machinery, and with scythes of a pattern which we should not hesitate to call extremely primitive." (*Board of Trade Journal*, 15th August, 1907.)

London (Notification of Glanders) Order of 1907.—In connection with the Glanders Order of 1907, attention may be directed to the London (Notification of Glanders) Order of 1907, made by the Board on 12th September to come into operation on 1st January, 1908. This order applies to the administrative County of London and to the City of London, and requires notification of disease.

Cultivation of Flax.—Flax is as easily grown as oats or barley. It is not very particular as regards soil, but prefers a light loam. The soil, however, should be clean; if weeds are numerous, hoeing must be resorted to. When seed is the chief object, 1 bushel per acre may be sown, but $1\frac{1}{2}$ to $1\frac{3}{4}$ bushels if straw is desired. The crop may follow clover, roots or corn, but should not be taken after corn except on clean land. Sowing should take place at the end of March or early in April, the ordinary corn-drills being used. The rows should be seven to eight inches apart. The crop must be horse-hoed if found necessary; but this should not be necessary in most cases.

Flax should be cut as soon as the seed is ripe, and the seed is best beaten out by means of the flail, as the thresher breaks the straw badly. The value of the crop is variable, depending on the demand for the straw, which, apart from its value for fibre, is locally employed for thatching purposes. For this purpose it is an excellent

material, and should readily sell for £2 per ton. The average crop yields from 16 to 18 bushels of seed, worth 5*s.* to 5*s.* 6*d.* per bushel, and 1½ to 2 tons of straw. The gross value is not likely to be greater than that of oats and barley, and is usually somewhat less. The advantage, where there is a demand for straw, is that the crop may be sown somewhat later than the cereals, and may thus occupy a field not ready for oats or barley.

Draining the Zuyder Zee.—In 1901 it was proposed, according to a note in the *Board of Trade Journal* (8th August, 1901), to close the Zuyder Zee by a dyke running from the North Holland coast to the Island of Wieringen, and thence to the Frisian coast, and to drain parts of the enclosed sea. The plan would involve the recovery in 18 years of nearly 114,900 acres of fertile land. With regard to this scheme H.M. Minister at The Hague writes:—" It may be well to set forth briefly the manner in which it is intended to dispose of the land when reclaimed. In order to prevent it from falling into the hands of speculators, it has been decided to divide the new polders into lots of 20 hectares, to be sold in successive zones. The object of this is to avoid the depreciation which would result from putting on the market a large number of lots at the same time. The authorities will try as far as possible to sell to cultivators, who will be afforded facilities of payment by means of annual instalments over a certain number of years. These cultivators will even receive advances for the construction of dwellings, stables, barns, &c. The proprietors are to be responsible for the maintenance of the dykes, locks, exhaust mills, &c.

" Four-fifths of the land thus given over to cultivation will be of excellent quality. By means of numerous soundings it has been established that the layer of soil varies from 5½ to 12 feet. This soil is so fertile that at the present time the peasants go and collect it on the flats at ebb tide, in order to use it as manure for their fields. The new polders can be cultivated for 40 or 50 years before it is necessary to manure the soil. The price, therefore, of £156 to £160 at which the hectare is valued, is in no way exaggerated. The average rent will be about 127 francs per hectare (£2 1*s.* 2*d.* per acre), and it has been calculated that to become a proprietor it will be merely necessary to pay annual instalments of approximately £6 8*s.* per hectare (£2 11*s.* 10*d.* per acre) over a period of 35 years. There will thus be created a large number of small peasant proprietors, who, it is true, will be able eventually to sell or let their holdings, but who will not easily be induced to do so, for in the Netherlands the peasant has an intense love of the soil."

H.M. Minister adds that he has received information to the effect that for the present the Government are not taking up the whole scheme, but will in the first instance confine themselves as an experiment to making the North-Western of the four proposed polders. Should this be successful the entire undertaking will no doubt be carried through without further delay. The cost of the North-Western polder, which will be formed by means of a dyke conecting the Island of Wieringen with the mainland and continued South to Medemblik, is expected to amount to some 40,000,000 florins (£3,330,000), as against some 189,000,000 florins (£15,750,000) for the entire scheme. (*Board of Trade Journal*, 19th September, 1907.)

Spurrey.—This plant, *Spergula arvensis*, is one of the commonest weeds on light land, and, if not checked, seeds rapidly and sheds its seed readily. In dealing with it an effort should be made to prevent it running to seed. Where it occurs in root crops they should be hoed by hand at least twice in the season, and hoeing should also be done in corn crops which contain much spurrey. If labour is not available for hoeing corn, sowing may be delayed until as late in the season as practicable, and an attempt should then be made to destroy spurrey and other annuals by working the land to a tilth as early in spring as possible. Weed seeds will then germinate rapidly, and the young weeds may be killed by harrowing before sowing corn.

SELECTED CONTENTS OF CURRENT PERIODICALS.

Bulletin of the Imperial Institute. V. 2.
The Sources, Manufacture and Industrial Uses of Alcohol.

Bulletin des Séances de la Société Nationale d'Agriculture, 1907. 6.
Production d'un Cidre se conservant doux, *M. Lindet.*

Revue des Eaux et Forêts, 1907. 17.
Jardinage et Futaie Regulière, *P. Schlumberger.*

Arbeiten aus der K. Biologischen Anstalt für Land- und Forstwirtschaft. V. 7.
Beiträge zur Kenntnis der Kartoffelpflanze und ihrer Krankheiten, i, *Otto Appel.*

Praktische Blätter für Pflanzenbau und Pflanzenschutz. August, 1907.
Bericht über die im laufenden Jahre bisher aufgetreten Schädlinge und Krankheiten der Feldfrüchte, *L. Hiltner.*

Die Landwirtschaftlichen Versuchs-Stationen. LXVII, I, u. II.
Untersuchungen über die Einwirkung von Nahrungsfett als Emulsion und als Substanz auf die Milchproduktion, *C. Beger;* Über die Einfluss der Mineraldüngung auf die Stickstoffbindung durch niedere Organismen im Boden, *H. Wilfarth* und *G. Wimmer;* Eine Schätzungs-Methode der Verunreinigungen in Leinsamenpresskuchen durch fremde Samen oder Früchte, *E. Schaffnit.*

Fühlings Landwirtschaftliche Zeitung. 56 Jahrgang.
13 Heft.—Fortschritte im landwirtschaftlichen Maschinenwesen, *Dr. Luedecke.*
15 Heft.—Rübenanbau- und Rübendüngungsversuche mit Kaltstickstoff und Chilisalpeter, *J. Klöppel.*
16 Heft.—Die Systematische Einteilung und Benennung der Getreidesorten für praktische Zwecke, *Dr. von Rümker.*
17 Heft.—Die Rentabilität des Flachsbaues, *Dr. Augstin.*
17 and 18 Heft.—Vergleichende Mahl- und Backversuche mit inländischen und ausländischen Weizensorten, *K. Windisch und K. Pulvermüller.*

Zeitschrift für Forst- und Jagdwesen. XXXIX. 9.
Das Kartellwesen und seine Bedeutung für die deutsche Holzindustrie, *von dem Borne;* Der VIII. Internationale landwirtschaftliche Kongress in Wien, Mai, 1907, *Dr. Jentsch.*

Zeitschrift für Pflanzenkrankheiten. XVII. 4.
Untersuchungen über einige Fungi imperfecti und die zugehörigen Ascomycetenformen, *H. Klebahn.*

Zeitschrift für Agrarpolitik. V. 6.
Die wirtschaftliche Bedeutung der deutschen ländlichen Genossenschaften, *Dr. Grabein.*

Landwirtschaftliches Jahrbuch der Schweiz, 1907. V.
Untersuchungen über das Abwerfen junger Kernobstfrüchte, *A. Osterwalder.*

Bulletin de l'Agriculture. XXIII. 7.
Les marbrures du beurre, *L. Marcas et C. Huyge.*

Annual Report of the Agricultural Experiment Station, Wisconsin, 1905–6.
Relation of soil bacteria to nitrogenous decomposition, *C. Hoffmann;* The nitrogen contents of soils as affected by methods of farming: Availability of phosphates in relation to soil acidity, *A. R. Whitson and others.*

Agricultural Gazette of New South Wales. XVIII. 8.
The Cattle Tick, *J. D. Stewart;* Fairy Rings and their Eradication, *G. H. Robinson.*

The Journal of the Department of Agriculture of Victoria. V. 8.
Grant to Agricultural Societies, *E. E. Duffus;* Silos and Silage, *A. S. Kenyon.*

ADDITIONS TO THE LIBRARY.

Australasia—

Thomson, G. S.—The Dairying Industry. Part I. The Milk and Cream Supply. (263 pp.) London: Crosby Lockwood & Son, 1907. 10s. 6d. net.

Denmark—

Aarsberetning om det kongelige danske Landhusholdningsselskabs Virksomhed, 1906-7. (284 pp.)

France—

Crochetelle, J.—La Cidrerie. (282 pp.) Paris: Ch. Amat.

Germany—

Deutsche Landwirtschafts-Gesellschaft. Jahrbuch Band 22. II. (243–433 pp.) Arbeiten, Heft. 126. Vorprüfung neuer milchwirtschaftlicher Geräte, 1906–7. (120 pp.) Heft 127. Felddüngungsversuche über die Wirkung der wichtigen Kalidüngesalze. Heft 128. Neuere Erfahrungen auf dem Gebiete der Tierzucht. (435 pp.) Berlin, 1907.

Great Britain—

Second National Poultry Conference, July 8–11, 1907. Official Report. (xxx + 382 pp.) London: 12, Hanover Square, W. 5s. net.

Nelson, T. H.—The Birds of Yorkshire. 2 vols. (843 pp.) London: A. Brown & Sons, 1907. 25s. net.

Johns, Rev. C. A.—Flowers of the Field. Entirely re-written and revised by G. S. Boulger. (926 pp.) London: S.P.C.K., 1905. 7s. 6d. net.

Essex Education Committee.—Notes on Agricultural Analyses, 1903–6. (71 pp.); The Essex Field Experiments, 1906. (26 pp.) Chelmsford: County Technical Laboratories, 1907.

Hubbard, A. J. and G.—Neolithic Dew-Ponds and Cattle-Ways. 2nd Edition. (114 pp.) London: Longman, Green & Co., 1907. 4s. 6d. net.

Memoirs of the Geological Survey. Summary of Progress for 1906. (181 pp.); The Geological Structure of the North-West Highlands of Scotland. (668 pp. + lii plates.) London: Stanford, 1907. 1s. and 10s. 6d. respectively.

Edinburgh and E. of Scotland College of Agriculture.—Manuring of Seeds Hay. (17 pp.)

Bradley, Edith and Crooke, May.—The Book of Fruit Bottling. (97 pp.) [Handbooks of Practical Gardening.] London: John Lane, 1907. 2s. 6d. net.

Wilcox, E. V.—Farm Animals. (357 pp.) London: Constable, 1907.

Mill, Dr. H. R.—British Rainfall, 1906. (100 + 280 pp.) London: Ed. Stanford, 1907. 10s.

Cheal, J.—Practical Fruit Culture. 6th Edition. (194 pp.) London: Geo. Bell, 1907. 2s. 6d.

Felthwaite, W. and Remington, J. S.—Science at Work. (83 pp.) London: Guilbert Pitman. 1s. net.

Cambridge University, Department of Agriculture.—Guide to Experiments, 1907. (162 pp.) Cambridge.

Lancaster County Council.—Farmers' Bull. 4. Destruction of Charlock. (11 pp.)

Eighth International Veterinary Congress, Budapest, 1905, Report. 3 vols. (848 + 704 + 360 pp.) Budapest, 1906.

Holland—

Department van Landbouw.—Verslagen des Rijkslandbouw proefstations over 1906–7. (86 pp.) The Hague: van Langenhuysen, 1907.

Ireland—

Flax Supply Association.—Report, 1906. (68 pp.) Belfast, 1907. 1s.

Italy—

Ministero di Agricoltura.—Atti del Consiglio di Agricoltura, 1905–6. (490 pp.)

Annali della Regia Scuola Superiore di Agricoltura di Portici, Serie 2ª. Vol. VI. Portici, 1906.

Russia—

Direction Générale de l'Organisation Agraire et de l'Agriculture.—Les Richesses Forestières de la Russie. (87 pp.) Bordeaux, 1907.

United States—

Alaska Agricultural Experiment Stations.—Report for 1906. (75 pp.) Washington, 1907.

Iowa State College of Agriculture.—Bull. 88.—The Vitality, Adulteration and Impurities of Clover, Alfalfa and Timothy Seed for Sale in Iowa in 1906. (69 pp.) Bull. 90.—Evergreens for the Iowa Planter. (46 pp.) Ames, 1907.

Kansas State Board of Agriculture:—

Report for Quarter ending March, 1907. (444 pp.)

Bull. 144.—Small Grain Crops. (141–193 pp.) Bull. 145. Spraying. (194–216 pp.) Bull. 146.—Kansas Law regulating the Sale of Concentrated Feeding Stuffs. (217–224 pp.) Manhattan, 1907.

Massachussetts Horticultural Society.—Transactions, 1906. Part II. (273 pp.) Boston, 1907.

Massachussetts State Board of Agriculture.—Report of Chief of the Cattle Bureau for 1906. (217–279 pp.) 1907.

Minnesota Agricultural Experiment Station.—Report, 1905–6. (361 pp.) Austin, 1906.

Nebraska Agricultural Experiment Station.—Bull. 91.—Experiments with Corn. (35 pp.) Bull. 92.—Cover-Crops for Young Orchards. (23 pp.) Bull. 93.—Cattle Feeding Experiments. (23 pp.) Bull. 94.—Fattening Pigs on Corn and Tankage. (12 pp.) Bull. 95.—Crop Production in Western Australia. (34 pp.) Bull. 96.—Some Insects injurious to Wheat during 1905–6. (36 pp.) Bull. 97.—Potato Experiments. (26 pp.) Bull. 98.—Spraying Demonstrations in Nebraska Apple Orchards. (35 pp.) Lincoln, 1907.

New Jersey Agricultural Experiment Stations.—Bull. 200.—The Cabbage and Onion Maggots. (27 pp.) Bull. 201.—Concentrated Feeding Stuffs. (46 pp.) Bull. 202.—Forest Trees of New Jersey. (52 pp.) Bull. 203.—Some Household Pests. (48 pp.) Bull. 204.—(i) Home-Grown Protein *v.* Purchased Protein; (ii) Distillers' Grains *v.* Gluten Feed; (iii) Summer Silage *v.* Soiling. (28 pp.) New Brunswick, 1907.

Wisconsin Agricultural Experiment Station:—

Report for 1905–6. (320 pp.)

Bull. 135.—The Spraying of Potatoes for Prevention of Leaf Blight and Rot. (24 pp.) Bull. 136.—Practical Directions for Preserving Native Fruits and Vegetables. (13 pp.) Bull. 137.—Conditions which Effect the Time of the Annual Flowering of Fruit Trees. (21 pp.) Bull. 138.—Land Drainage. (40 pp.) Bull. 139.—The Principles and Maintenance of Soil Fertility. (28 pp.) Bull. 140.—Development of Factory Dairying in Wisconsin, with Map showing Location of Cheese Factories and Creameries. (18 pp.) Bull. 141.—The Horse Breeding Industry of Wisconsin. (162 pp.). Bull. 142.—Licensed Commercial Feeding Stuffs, 1906. (54 pp.) Madison, 1906.

Bull. 143.—The Spread of Tuberculosis through Factory Skim Milk with Suggestions as to Its Control. (28 pp.) Bull. 144.—Official Tests of Dairy Cows. (65 pp.) Bull. 145.—The Relative Value of Shelled Corn and Corn Meal for Fattening Pigs. (16 pp.) Bull. 146.—Drainage Conditions of Wisconsin. (47 pp.) Bull. 147.—Report on the Northern Sub-Stations for 1906. (48 pp.) Bull. 148.—The Pasteurization and the Inspection of Creamery and Cheese Factory By-Products. (17 pp.) Bull. 149.—Licensed Commercial Fertilizers and Feeding Stuffs, 1907. (32 pp.) Bull. 150.—Sugar Beet Experiments, 1906. (45 pp.) Madison, 1907.

[Books may be borrowed from the Board's Library on certain conditions, which may be ascertained on application.]

PRICES OF AGRICULTURAL PRODUCE.

AVERAGE PRICES of LIVE STOCK in ENGLAND and SCOTLAND in the Month of September, 1907.

(*Compiled from Reports received from the Board's Market Reporters.*)

Description.	ENGLAND. First Quality.	ENGLAND. Second Quality.	SCOTLAND. First Quality.	SCOTLAND. Second Quality.
FAT STOCK :—	per stone.*	per stone.*	per cwt.†	per cwt.†
Cattle :—	*s.* *d.*	*s.* *d.*	*s.* *d.*	*s.* *d.*
Polled Scots	7 8	—	37 9	34 4
Herefords	8 0	7 4	—	—
Shorthorns	7 9	7 0	36 7	33 4
Devons	8 1	7 5	—	—
	per lb.* *d.*	per lb.* *d.*	per lb.* *d.*	per lb.* *d.*
Veal Calves	7½	7	7½	6
Sheep :—				
Downs	9	8¼	—	—
Longwools	8¼	7½	—	—
Cheviots	9	8½	8¾	7¾
Blackfaced	8	7½	8	7¼
Cross-breds	8¾	8	8¾	8
	per stone.*	per stone.*	per stone.*	per stone.*
Pigs :—	*s.* *d.*	*s.* *d.*	*s.* *d.*	*s.* *d.*
Bacon Pigs	6 9	6 3	6 2	5 7
Porkers	7 1	6 8	6 7	6 0
LEAN STOCK :—	per head.	per head.	per head.	per head.
Milking Cows :—	£ *s.*	£ *s.*	£ *s.*	£ *s.*
Shorthorns—In Milk	20 19	17 17	22 15	17 19
,, —Calvers ...	20 9	17 8	19 17	17 0
Other Breeds—In Milk ..	21 0	14 4	18 13	15 13
,, —Calvers ...	14 0	12 17	18 14	15 8
Calves for Rearing	2 1	1 13	2 2	1 9
Store Cattle :—				
Shorthorns—Yearlings ...	10 2	8 12	9 17	8 0
,, —Two-year-olds ...	14 9	12 7	14 10	11 13
,, —Three-year-olds	16 16	15 3	15 5	13 19
Polled Scots—Two-year-olds	—	—	14 9	13 1
Herefords— ,,	14 14	12 19	—	—
Devons— ,,	14 3	11 2	—	—
Store Sheep :—	*s.* *d.*	*s.* *d.*	*s.* *d.*	*s.* *d.*
Hoggs, Hoggets, Tegs, and Lambs—				
Downs or Longwools ...	39 10	34 5	—	—
Scotch Cross-breds... ...	—	—	27 9	23 6
Store Pigs :—				
Under 4 months	26 6	20 0	19 0	15 0

* Estimated carcase weight.

† Live weight.

AVERAGE PRICES of DEAD MEAT at certain MARKETS in ENGLAND and SCOTLAND in the Month of September, 1907.

(Compiled from Reports received from the Board's Market Reporters.)

Description.	Quality.	London.		Birmingham.		Manchester.		Liverpool.		Glasgow.		Edinburgh.	
		per cwt.		per cwt.		per cwt.		per cwt.		per cwt.		per cwt.	
		s.	d.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.
BEEF :—													
English	1st	53	0	51	0	49	0	49	0	56	6*	51	0*
	2nd	51	6	46	0	45	6	45	6	56	0*	45	0*
Cow and Bull ...	1st	41	0	43	6	43	0	41	6	44	6	39	0
	2nd	32	6	39	0	38	6	36	6	37	6	34	0
U.S.A. and Canadian :—													
Port Killed ...	1st	53	6	49	6	48	0	50	0	49	6	48	0
	2nd	49	6	45	0	44	6	46	6	46	6	—	
Argentine Frozen—													
Hind Quarters ...	1st	35	6	36	6	37	6	36	6	38	0	37	6
Fore ,, ...	1st	24	6	26	6	25	6	25	6	27	6	26	6
Argentine Chilled—													
Hind Quarters ...	1st	48	0	47	0	44	6	42	6	43	6	—	
Fore ,, ...	1st	30	6	31	6	31	0	29	0	29	0	—	
American Chilled—													
Hind Quarters ...	1st	59	6	57	6	57	0	56	6	59	0	58	6
Fore ,, ...	1st	37	6	37	6	36	0	36	0	38	0	38	6
VEAL :—													
British	1st	64	6	59	6	60	6	68	0	—		—	
	2nd	59	6	49	0	56	0	64	0	—		—	
Foreign	1st	65	6	—		—		—		—		—	
MUTTON :—													
Scotch	1st	71	6	70	0	70	0	72	6	71	0	66	0
	2nd	66	0	56	0	65	6	66	6	52	6	53	0
English	1st	67	6	70	0	66	6	67	0	—		—	
	2nd	63	0	55	6	61	0	62	6	—		—	
U.S.A. and Canadian—													
Port killed ...	1st	—		—		—		—		—		—	
Argentine Frozen ...	1st	32	6	32	0	32	6	32	6	29	6	30	6
Australian ,, ...	1st	31	0	30	6	30	6	30	6	29	6	—	
New Zealand ,, ...	1st	41	6	37	6	42	0	42	0	29	6	—	
LAMB :—													
British	1st	73	6	69	6	67	6	69	6	71	6	68	0
	2nd	71	0	64	6	62	6	63	6	56	0	56	0
New Zealand ..	1st	52	0	52	0	51	6	51	6	48	0	52	0
Australian	1st	—		48	0	—		—		43	0	—	
Argentine	1st	—		48	0	46	6	46	6	—		—	
PORK—													
British	1st	60	0	64	0	60	0	59	6	55	6	51	6
	2nd	53	0	56	0	56	0	55	6	53	6	43	0
Foreign	1st	59	0	62	6	60	6	60	6	—		—	

* Scotch.

AVERAGE PRICES of **British Corn** per Quarter of 8 Imperial Bushels, computed from the Returns received under the Corn Returns Act, 1882, in each Week in 1905, 1906 and 1907.

Weeks ended (*in* 1907).	Wheat.						Barley.						Oats.					
	1905.		1906.		1907.		1905.		1906.		1907.		1905.		1906.		1907.	
	s.	*d.*	*s.*	*d.*	*s.*	*d.*	*s.*	*d.*	*s.*	*d.*	*s.*	*d.*	*s.*	*d.*	*s.*	*d.*	*s.*	*d.*
Jan. 5 ...	30	4	28	4	26	0	24	4	24	6	23	11	16	3	18	2	17	3
„ 12 ...	30	4	28	6	26	1	24	6	24	8	24	2	16	3	18	4	17	4
„ 19 ...	30	5	28	5	26	1	25	0	24	11	24	1	16	5	18	4	17	5
„ 26 ...	30	6	28	7	26	2	25	1	25	1	24	5	16	7	18	7	17	5
Feb. 2 ...	30	6	28	10	26	3	25	0	25	1	24	4	16	7	18	10	17	5
„ 9 ...	30	7	28	10	26	6	25	2	25	3	24	5	16	8	18	10	17	7
„ 16 ...	30	5	28	11	26	7	25	2	25	6	24	1	16	9	19	0	17	7
„ 23 ...	30	10	28	10	26	10	25	0	25	4	24	2	16	10	19	0	17	9
Mar. 2 ...	30	8	28	8	26	9	25	2	25	0	24	2	16	10	19	0	17	9
„ 9 ...	30	9	28	5	26	8	25	2	25	1	23	11	16	10	18	8	17	11
„ 16 ...	30	10	28	5	26	10	24	11	24	8	24	2	16	10	18	10	18	0
„ 23 ...	30	9	28	4	26	10	25	2	24	4	24	0	17	0	18	8	18	1
„ 30 ...	30	9	28	3	26	8	25	1	24	5	23	9	16	11	18	11	18	2
Apl. 6 ...	30	9	28	7	26	9	25	6	24	2	24	3	17	0	18	11	18	3
„ 13 ...	30	8	28	11	26	8	24	3	24	4	23	9	17	6	19	4	18	6
„ 20 ...	30	8	29	4	26	8	24	4	24	0	23	3	17	5	19	1	18	7
„ 27 ...	30	9	29	6	26	10	24	4	24	0	23	3	17	9	19	6	18	9
May 4 ...	30	8	29	10	27	0	25	3	23	10	23	6	18	0	19	9	19	3
„ 11 ...	30	8	30	1	27	6	24	10	24	1	24	0	18	3	20	0	19	7
„ 18 ...	30	10	30	3	28	4	24	8	23	10	23	10	18	5	20	1	20	1
„ 25 ...	30	11	30	4	29	7	24	4	24	2	24	3	18	8	20	2	20	5
June 1 ...	31	3	30	4	31	4	23	6	22	10	24	0	19	1	20	5	20	8
„ 8 ...	31	4	30	3	32	0	24	0	23	4	24	7	18	11	19	11	20	7
„ 15 ...	31	7	30	4	31	10	26	0	23	6	24	7	19	1	20	2	20	11
„ 22 ...	31	7	30	5	31	4	23	9	22	10	24	11	18	10	20	2	20	9
„ 29 ...	31	8	30	3	31	2	23	2	24	3	24	6	19	7	20	1	20	8
July 6 ...	32	1	30	2	31	3	22	11	23	0	24	8	19	6	20	2	20	11
„ 13 ...	32	3	30	5	32	0	23	10	23	8	24	10	19	7	20	4	20	11
„ 20 ...	32	2	30	3	32	6	23	7	23	2	24	6	18	11	20	5	21	1
„ 27 ...	32	3	30	5	32	11	23	11	22	4	27	3	19	3	20	2	20	8
Aug. 3 ...	31	11	30	9	33	2	22	0	22	1	26	4	18	4	19	3	21	2
„ 10 ...	30	5	30	5	33	5	22	5	23	0	26	6	16	11	17	11	21	3
„ 17 ...	28	5	29	0	33	6	23	4	24	2	25	9	16	4	17	0	20	4
„ 24 ...	27	1	27	9	33	7	23	6	25	0	25	0	15	9	16	10	19	8
„ 31 ...	26	11	26	9	33	10	23	5	24	3	24	6	15	9	16	6	18	11
Sept. 7 ...	27	1	26	4	31	11	23	4	24	9	24	2	15	11	16	3	17	7
„ 14 ...	26	11	25	11	31	4	23	7	24	3	24	4	16	0	16	1	17	6
„ 21 ...	26	8	25	9	31	5	23	10	24	3	25	0	15	11	16	0	17	6
„ 28 ...	26	9	25	9	31	8	24	3	24	8	25	3	16	1	16	2	17	8
Oct. 5 ...	26	9	26	1	32	6	24	9	25	0	25	5	16	3	16	3	17	9
„ 12 ...	26	11	26	3			24	10	25	3			16	6	16	7		
„ 19 ...	27	1	26	6			25	0	24	10			16	7	16	8		
„ 26 ...	27	4	26	7			24	11	24	10			16	8	16	10		
Nov. 2 ...	27	10	26	7			24	9	24	8			17	1	16	11		
„ 9 ...	28	3	26	6			24	10	24	8			17	4	17	1		
„ 16 ...	28	7	26	4			24	6	24	4			17	8	17	2		
„ 23 ...	28	5	26	3			24	6	24	1			17	9	17	3		
„ 30 ...	28	8	26	1			24	6	24	1			17	11	17	2		
Dec. 7 ...	28	6	26	1			24	7	24	1			17	11	17	4		
„ 14 ...	28	5	26	1			24	5	23	11			17	11	17	3		
„ 21 ...	28	4	26	3			24	6	24	3			17	11	17	3		
„ 28 ...	28	3	26	0			24	7	24	1			18	1	17	3		

AVERAGE PRICES of **Wheat**, **Barley**, and **Oats** per Imperial Quarter in FRANCE, BELGIUM, and GERMANY, and at PARIS, BERLIN, and BRESLAU.

—		Wheat. 1906.	Wheat. 1907.	Barley. 1906.	Barley. 1907.	Oats. 1906.	Oats. 1907.
		s. d.	*s. d.*	*s. d.*	*s. d.*	*s. d.*	*s. d.*
France:	August ...	39 7	42 7	25 1	25 9	23 2	21 2
	September	38 9	39 10	25 0	25 1	22 6	19 10
Paris:	August ...	39 11	43 9	25 10	26 11	24 4	21 7
	September	38 9	40 6	25 5	26 8	22 2	20 5
Belgium:	July ...	29 8	35 4	23 11	25 5	22 7	24 0
	August ...	29 5	35 2	22 10	25 0	20 10	23 3
Germany:	August ...	38 1	46 1	26 4	28 3	21 9	25 10
	September	37 9	47 10	28 3	30 6	21 0	24 1
Berlin:	July ...	39 8	45 7	—	—	22 10	27 3
	August ...	38 0	46 6	—	—	21 7	27 2
Breslau:	July ...	37 4	45 6	27 3 (brewing) 26 3 (other)	29 7 (brewing) 27 0 (other)	23 9	25 1
	August ...	37 2	45 5	27 4 (brewing) 23 3 (other)	29 5 (brewing) 27 0 (other)	24 1	25 0

NOTE.—The prices of grain in France have been compiled from the official weekly averages published in the *Journal d'Agriculture Pratique*; the Belgian quotations are the official monthly averages published in the *Moniteur Belge*; the German quotations are taken from the *Deutscher Reichsanzeiger*, the prices for the German Empire representing the average of the prices at a number of markets.

AVERAGE PRICES of **British Wheat, Barley,** and **Oats** at certain Markets during the Month of September, 1906 and 1907.

—	Wheat. 1906.	Wheat. 1907.	Barley. 1906.	Barley. 1907.	Oats. 1906.	Oats. 1907.
	s. d.	*s. d.*	*s. d.*	*s. d.*	*s. d.*	*s. d.*
London...	27 6	32 9	25 11	25 9	17 1	18 7
Norwich	26 2	31 3	24 1	25 7	15 8	17 0
Peterborough	25 2	31 2	23 11	24 1	15 5	16 11
Lincoln...	25 9	31 8	24 7	24 5	15 7	17 5
Doncaster	26 2	33 11	22 9	25 3	16 2	19 2
Salisbury	25 9	31 0	22 8	24 7	17 2	17 6

AVERAGE PRICES of PROVISIONS, POTATOES, and HAY at certain MARKETS in ENGLAND and SCOTLAND in the Month of September, 1907.

(*Compiled from Reports received from the Board's Market Reporters.*)

Description.	London. First Quality.	London. Second Quality.	Bristol. First Quality.	Bristol. Second Quality.	Liverpool. First Quality.	Liverpool. Second Quality.	Glasgow. First Quality.	Glasgow. Second Quality.
	s. d.	*s. d.*	*s. d.*	*s. d.*	*s. d.*	*s. d.*	*s. d.*	*s. d.*
BUTTER :—	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.
British ...	13 0	12 0	12 6	11 0	—	—	14 0	—
	per cwt.	per cwt.	per cwt.	per cwt.	per cwt.	per cwt.	per cwt.	per cwt.
Irish Creamery	106 6	104 0	110 0	106 6	106 6	104 6	108 0	—
,, Factory	94 0	87 6	93 0	87 6	93 6	83 6	—	—
Danish ...	114 0	111 0	—	—	115 0	112 0	114 0	—
Russian ...	98 6	94 0	98 0	84 0	96 6	86 0	99 0	90 0
Australian ...	98 6	96 0	101 6	89 6	—	—	—	—
New Zealand	107 6	103 6	106 0	102 0	—	—	—	—
CHEESE :—								
British—								
Cheddar ...	72 0	65 0	77 0	66 0	72 0	65 0	63 6	59 0
					120 lb.	120 lb.		
Cheshire ...	—	—	—	—	66 0	59 6	—	—
					per cwt.	per cwt.		
Canadian ...	59 0	58 0	58 6	56 6	59 0	57 6	59 6	57 0
BACON :—								
Irish	64 6	62 6	—	—	65 6	62 0	67 6	65 6
Canadian ...	57 6	56 0	60 6	56 0	59 0	54 0	60 6	56 6
HAMS :—								
Cumberland ...	100 6	95 0	—	—	—	—	—	—
Irish	100 0	92 0	—	—	—	—	103 0	90 6
American (long cut) ...	59 0	57 0	55 6	52 0	53 6	49 0	55 0	51 0
EGGS :—	per 120.	per 120.	per 120.	per 120.	per 120.	per 120.	per 120.	per 120.
British ...	13 1	11 3	12 6	—	—	—	—	—
Irish	11 10	10 9	10 7	9 10	10 7	9 5	10 10	9 8
Danish ...	11 6	10 7	11 6	10 6	10 11	10 2	10 10	9 11
POTATOES :—	per ton.	per ton.	per ton.	per ton.	per ton.	per ton.	per ton.	per ton.
British Queen	73 6	66 0	78 6	70 0	101 6	95 0	—	—
Scottish Triumph ...	70 0	65 0	78 6	70 0	96 6	91 6	—	—
Up-to-Date ...	71 0	63 6	80 0	70 0	98 6	91 6	—	—
HAY :—								
Clover ...	105 0	94 0	90 0	80 0	101 0	72 6	65 6	60 6
Meadow ...	95 0	84 0	85 0	75 0	—	—	65 0	60 0

DISEASES OF ANIMALS ACTS, 1894 to 1903.

NUMBER of OUTBREAKS, and of ANIMALS Attacked or Slaughtered.

GREAT BRITAIN.

(From the Returns of the Board of Agriculture and Fisheries.)

Disease.	September.		9 Months Ended September.	
	1907.	1906.	1907.	1906.
Swine-Fever :—				
Outbreaks	138	61	1,961	848
Swine Slaughtered as diseased or exposed to infection ...	717	389	9,212	4,809
Anthrax :—				
Outbreaks	77	51	830	671
Animals attacked	86	64	1,089	972
Glanders (including Farcy) :—				
Outbreaks	40	62	662	825
Animals attacked	86	124	1,522	1,549
Sheep-Scab :—				
Outbreaks	5	7	421	307

IRELAND.

(From the Returns of the Department of Agriculture and Technical Instruction for Ireland.)

Disease.	September.		9 Months Ended September.	
	1907.	1906.	1907.	1906.
Swine-Fever :—				
Outbreaks	11	4	120	81
Swine Slaughtered as diseased or exposed to infection ...	408	62	2,078	914
Anthrax :—				
Outbreaks	1	—	2	3
Animals attacked	1	—	4	7
Glanders (including Farcy) :—				
Outbreaks	1	—	5	6
Animals attacked	1	—	9	14
Sheep-Scab :—				
Outbreaks	9	10	199	171

(5,000 10 | 07—H & S 2255)

THE JOURNAL

OF THE

BOARD OF AGRICULTURE.

Vol. XIV. No. 8.

NOVEMBER, 1907.

THE AMERICAN GOOSEBERRY MILDEW IN WORCESTERSHIRE.

KENNETH G. FURLEY.

The American gooseberry mildew (*Sphærotheca mors uvæ*), has created almost as much sensation and roused as much interest among fruit growers, nurserymen and market gardeners during the present year as the Colorado beetle did some years ago. It has been asserted that it is no new importation, and persons have been found who declare they knew it thirty years ago, and have had experience of it in many seasons since. Such witnesses are, however, in no case botanists or persons of scientific training, and are probably unable to distinguish the American from the European gooseberry mildew, which latter is a parasite of a much less serious nature, though undoubtedly very common, and occasionally causing a certain amount of loss. In many cases the damage caused by green fly has been mistaken for the fungus. The positive testimony as to the existence of the American gooseberry mildew in England for more than four or five years is, therefore, very small, while the circumstantial evidence as to probable importation of the disease at some time about the beginning of that period is very strong. There is, moreover, good reason to believe that although the disease has appeared in several counties of England, it was first introduced into Worcestershire, and that the infection has spread from that district to the other places where it has since been discovered.

Apart from a small outbreak in Kent, Worcestershire was the only county known to be affected during the greater part of the first six months of 1907, and Worcestershire was the first county in which a systematic attempt was made to cope with the disease. As I was engaged during a considerable part of that time in searching for infected bushes, and had special opportunities for noting the manifestations of the disease and its behaviour under the spraying operations carried on by the County Council, I have thought it worth while to put on record some of my observations made at the time. Such a record may be of some use in dealing with the history of the mildew in England, and may serve as a guide for others, whether in this country or abroad, who may be interested in the subject. It may, perhaps, save others from adopting costly and troublesome methods of spraying which have already been proved to be unsuccessful.

It is not surprising that the American gooseberry mildew was first discovered in England in the Evesham district of Worcestershire, since this area is one of the leading fruit-growing districts in this country, and as it grows more gooseberries than any other county, it is more likely to be searched. But it is remarkable that the disease should have got such a firm hold before being identified. It was discovered in the autumn of 1906 by Mr. E. S. Salmon, but in the course of the search that was made during the next few months, while the disease was still in its winter stage, no less than 27 other places were found to be infected. The disease was practically confined to the southern half of the county—that is to say, the Evesham and Pershore districts—an inspection of a fairly large area to the north of Worcester revealing only two cases. The discovery of the first of these led to the discovery of the second.

The situation of the infected premises is the first point to be dealt with. The fruit-growing area of Worcestershire may be divided into the Evesham district and the Pershore district, which are distinct though practically adjoining. The most important centre of disease in the first of these districts is Lenchwyck, where twenty-one infected plantations were found. These lay all together, practically touching each other, except in the case of one which was distant from

the others about a quarter of a mile. Thirteen of these were found to be affected during the winter, while the disease was discovered in the remaining eight during the summer. The original source of disease was not, however, traced. In the Pershore district six outbreaks were detected, three of which at Pinvin practically adjoin each other; while two more were found about half a mile away. In one of the two latter cases only was the mildew found in the winter; the other plantation, which was carefully examined without disease being found, became affected in the summer. Between Pershore and Evesham eight outbreaks have been reported, including cases found during the summer, four of which lay close together, while four were somewhat widely separated. Beyond Evesham four more cases were found, the plantations being in these instances also more or less isolated. Of the remaining cases one occurred in the extreme south of the county, one close to Worcester and another about seven miles to the north of that city. The area is wide, but the disease is scarcely found outside it; while though by no means every inch in each plantation is affected, there are few gardens that have not a certain number of diseased plants. This, then, appears to be a characteristic of the progress of the infection, and the experience of Worcestershire agrees with the experience of Ireland, Sweden and Germany.*

SITUATION AND SOIL.—It has been asserted confidently that the mildew flourishes only on bushes growing in damp and low-lying situations.† This is undoubtedly the case with several of the outbreaks, notably in one place near Evesham, where the plantation slopes down to a small stream. In two plantations at Pinvin (Pershore) adjoining each other, the disease was noticeable only on the lowest parts of the ground which lie low, and are rather damp from the drainage

* The following sentence, taken from Herr Wilhelm Herter's article on the "American Gooseberry Mildew" in the *Centralblatt für Bakteriologie, Parasitenkunde und Infektionskrankheiten*, Zweite Abt., Bd. xvii., No. 22–24, should perhaps scarcely be taken literally:—"Plötzlich an einem Orte erscheinend, erobert sich der Schädling planmässig von diesem Punkte aus das neue Gebiet, von Jahr zu Jahr schneller und verheerender um sich greifend und alles vernichtend, was ihm in den Weg kommt." The disease has certainly not appeared in so serious a form in England as yet.

† This appears to be the case in Germany. Herr Wilhelm Herter says (*loc. cit*): "In trockenen und erhöht gelegenen Gärten fand ich Sphærotheca fast nie."

of the land above. As soon as the higher ground is reached the disease disappears. In both cases the soil is fairly stiff. In several other cases the whole plantation lay rather low, and the soil was stiff and somewhat damp. But in many other cases the disease occurred on moderately high ground with a medium soil. In a few cases the land lay high, and the soil was of a good medium quality, most suitable for the growth of gooseberry bushes. The quality was clearly shown by the way in which several newly-planted bushes had grown, compared with the other bushes of the same batch which had been left on the fairly stiff and damp soil where they had been propagated. During the summer of 1907, which has proved exceptionally wet, disease was detected in several plantations on fairly high land, and in one case on very high land. There is, however, no evidence to show whether bushes on high, warm, dry land would be capable of resisting the infection in more favourable seasons.

AGE OF BUSHES ATTACKED.—Bushes of practically all ages were found to be attacked by the mildew.* The disease was seen on bushes of one and two years old, and it seems probable that these had the disease on them when planted as cuttings in the first instance—that is to say, the parent bushes were probably affected. In case of bushes from three to five years old there is reason to believe that some, at any rate, were affected when planted, while others were probably infected by other bushes in the neighbourhood. The older bushes were frequently the most diseased, in one case practically every shoot on the bushes being found to be attacked. In other plantations bushes of seven or eight years old were found to be diseased, while in a large number the diseased bushes had reached the age of ten to twelve years.

VARIETIES OF GOOSEBERRIES ATTACKED.—There appeared to be no variety of gooseberry among those grown in Worcestershire which was capable of resisting disease. The following were found to be most frequently attacked:—Whinham's Industry, Lancashire Lad, Keepsake, Rushwick Seedling, and, to a less extent, Crown Bob, Careless and Warrington. In one case May Duke was found diseased, though very

* Herr Wilhelm Herter says (*loc. cit.*): "Hochstämme werden ebenfalls weniger gern befallen, doch ist u. a. Prof. Eriksson hierüber der entgegengesetzten Ansicht."

slightly; in another, and rather more serious case, the variety was Ocean Green. Several varieties of the Lancashire Prize gooseberries, including Admiration, Bollin Hall, and Snowdrop, were found infected in one instance.

APPEARANCE OF THE DISEASE.—The mildew in its winter stage was found in all cases only on the wood of the young shoots of the year's growth. No signs of disease were found on the wood of the previous year's growth, or on the older wood. The mildew, when it has passed fully into the winter stage, covers the stem with a dark brown felted scurfy covering, which consists of the spawn (mycelium) of the fungus bearing the fruit conceptacles with the winter spores. The patches of spawn either form blotches scattered over the surface of the wood towards the tip of the shoot or completely invest the tip of the shoot for a distance of several inches, when the tip usually becomes more or less shrivelled up from the injury inflicted. In some cases the tips of the shoots, when badly infected by the fungus, are destroyed. In a large number of shoots attacked it was noticed that the mildew persisted throughout the winter in scattered greyish patches on the wood, instead of changing into a uniform brown colour. It was also observed that when the suckers of the bushes had been attacked the mildew was visible not only on the tips of the shoots but extended down for a distance of a foot, and in several cases of eighteen inches. The disease was found most generally on the top shoots of the bushes, though in very bad attacks both upper and lower shoots were affected. In some cases there was hardly a shoot which was free from the disease.

REMEDIAL MEASURES.—When the disease was discovered in Worcestershire, the news was received with great alarm. Owing, however, to the divergence of opinion expressed as to the serious nature of the infection a contrary opinion sprang up, and in many quarters the feeling changed to one of almost complete indifference. It was asserted that the mildew had been present in the county for many years past, that the injury it had inflicted in Ireland and elsewhere had been exaggerated, and that the climatic conditions of Worcestershire were unfavourable to the continuance of the disease. These statements appear to be due to a confusion of the

American gooseberry mildew (*Sphærotheca mors uvæ*) with the European gooseberry mildew (*Microsphaera grossulariae*), which has undoubtedly been present for many years in this country, and to the likeness between the appearance of the affected shoots and those attacked by "green fly." The tips of the shoots of bushes that have suffered from a severe attack of this latter pest present the same appearance as those affected with the mildew; but in the case of the latter the brown felted scurfy covering can be scraped off with the finger nail, while in the case of the injury caused by the "green fly" it is the actual surface of the shoot which has become discoloured. This uncertainty of opinion led many growers to refuse to take any steps to deal with the disease. In one case infected cuttings were planted out to see what the effect in the spring would be. In several cases nothing at all was done, the infected shoots being left on the old bushes. In a certain number of cases, where bushes which had already been pruned were discovered to be still affected, the owners were unwilling to go over the bushes again. Several growers, however, immediately sent men round to re-prune the affected bushes, on being informed of the presence of disease in their plantations. In one case, at any rate, the owner, on being informed of the presence of disease in his plantation, immediately grubbed up and burnt all the affected bushes—about fifty in number.

As there was at this time no legal power to compel uniformity of action, the Worcestershire County Council, at their own expense, sent men round to prune off and burn all the affected shoots at several places where the worst attacks occurred; and as many owners refused even to spray their bushes, this work was undertaken on their behalf as well. Spraying was begun on 26th March, just after the buds had begun to burst, and potassium sulphide (liver of sulphur) was first used, as this had proved in many trials in the United States to be the best fungicide for stopping the spread of the disease. Unfortunately, it was found impossible to spray at more than thirteen plantations out of the twenty-eight that had been discovered up to the middle of March, as the work had to be done at intervals of a fortnight.

The Department of Agriculture for Ireland advises spraying

the bushes thoroughly with potassium sulphide in the proportion of one ounce to two gallons of water, the treatment to be repeated at intervals of a fortnight; and for subsequent sprayings a stronger solution of two ounces of potassium sulphide dissolved in three gallons of water.

As it was thought that there might be a danger in commencing with one ounce to two gallons of water,—the experience of some foreign countries showing that this strength caused the leaves and berries to fall off—spraying was commenced on 26th March with potassium sulphide at the rate of one ounce to three gallons of water. Three plantations at Pinvin (Pershore) and ten at Lenchwyck (Evesham) were dealt with.

As no scorching of the foliage or other ill effect was apparent from the use of the wash at this strength in the case of the first plantation, the strength was increased to one ounce to two gallons of water, and this solution was used for the first spraying at the other twelve plantations.

At the second spraying a further increase was made in the strength of the wash, one ounce of potassium sulphide being used to one and three-quarter gallons of water. From the use of the wash at this strength no scorching of the foliage or injury to the blossom, which was fully out, was noticeable, and the strength was again increased on 22nd April to one ounce to one and a half gallons of water. Still no injury of any sort to the bushes was apparent, and a stronger solution of one ounce to one and a quarter gallons of water was tried.

At the fourth spraying of the affected bushes, which was commenced on 15th May, it was decided to try one ounce of potassium sulphide to one gallon of water. At the end of May it was thought advisable to substitute sodium sulphide in the place of the potassium sulphide (liver of sulphur) which had been used hitherto, partly owing to the former being manufactured commercially and in consequence being considerably lower in price than the latter. The potassium sulphide was obtained at 7*d.* per lb., in 20 lb. lots. It could most probably have been obtained at a cheaper rate in larger quantities, but it was thought more satisfactory to procure it in small lots, so as to ensure it being quite fresh. The price of the sodium sulphide was £6 per ton, which works out at less than 1*d.* per lb. The spraying with the sodium sulphide

was commenced about the end of May, when the same strength as that used with the potassium sulphide (*i.e.*, one ounce to one gallon of water) was tried. At one plantation at Lenchwyck, however, it was decided still to continue the spraying with the potassium sulphide, in order to see what the difference in the results might be between this and the sodium sulphide.

The bushes after this treatment still continued to look very healthy, there being no signs of the berries falling off or of the foliage being scorched in any way. There was as yet no appearance of the disease in its summer stage on the berries or leaves of the bushes in the affected plantations which had been sprayed, nor in the plantation at Lenchwyck which had been left unsprayed. The wash was shortly afterwards used at the rate of one and a quarter ounces of sodium sulphide to one gallon of water, and as still no ill effects were visible, it was decided to strengthen it on 7th June to one and a half ounces to one gallon of water.

At this time, however, an examination of the bushes at the affected plantation at Lenchwyck, at which no spraying at all had been carried out, revealed rather suspicious symptoms of the mildew, and, on a further examination three days later, the mildew was found in its summer stage on the berries. The mildew first appeared in white powdery patches, very similar to the hop mould, but shortly afterwards became dark brown in colour and formed dark scurfy blotches or scabs on the ripening berries. Spraying the affected bushes in this plantation was immediately commenced; the wash being used at the rate of three ounces of sodium sulphide to one gallon of water, or double the strength at which it was being used at the remaining plantations which had undergone previous treatment.

The wash, when used at this double strength, apparently checked the spread of the disease on the berries, though it did not appear to destroy it. On 5th July, however, the mildew was seen to be still spreading on the young shoots, and the young leaves were covered with the disease, even after the bushes had been twice sprayed thoroughly. It may be mentioned that even at this strength the wash had no effect in checking the growth of the bushes, nor were there any

signs either of the leaves or berries falling off, or even of any scorching of the foliage, although the leaves felt quite greasy for several days after the spraying. The mildew was undoubtedly worse in this plantation where the bushes were grown under plum or other trees, and where the plantations had become very much overgrown. It was quite dark underneath, and the soil was inclined to be damp. Several of these bushes which were attacked by the American gooseberry mildew were also found to be suffering from a bad attack of the European gooseberry mildew (*Microsphaera grossulariae*), which attacks the leaves and, in rare cases, the berries.

I think the fungus must have been longer on these bushes than on any others in this neighbourhood, and probably the first outbreak occurred here. The spraying of the other plantations was continued until 8th July, when the seventh spraying of the affected bushes had been completed. The wash at the rate of one and a half ounces to one gallon of water was still used.

Meanwhile the mildew had quite recently made its appearance in another fairly large plantation at Lenchwyck, which had been regularly sprayed, but in which all the affected shoots had not been pruned off the previous winter. The situation of this plantation was low and damp, the bushes were very much overgrown by the plum trees, and rain had nearly always occurred about the time when the spraying was carried out. In this case, however, the mildew was only visible on the tips of the shoots and on the leaves, which were mostly attacked on the underside. In some instances practically the whole bush was affected, especially at the lower end of the plantation. It was now also learnt that the mildew had again made its appearance on the fruit in the affected plantation in the south of the county—this being the second year in which the fruit had been diseased here. At one other outbreak at Lenchwyck three berries were found to be affected, although careful pruning of the affected shoots in the winter, followed by regular spraying, had been carried out; but there were as yet no signs of the mildew appearing on the leaves or shoots of the bushes. Up to 8th July the above four cases were the only outbreaks in Worcestershire in which the mildew had been seen at all in its summer stage,

but in two of these, at any rate, the sodium sulphide did not appear to have had much effect in checking the spread of the disease, which had developed in one case on the leaves and the shoots, and in the other on the berries. In the former case the affected shoots had not been pruned off in the winter, but in the latter case, at Lenchwyck, all the affected shoots had been carefully pruned off and burnt. It is true that at another plantation at Lenchwyck, where the young bushes had been very carefully pruned and the affected shoots burnt, there were no signs of the mildew up to this time. It was at this plantation that spraying with the potassium sulphide had been continued right up to 8th July, and no sodium sulphide had been used at all. The spraying experiments were now brought to a close, for the Worcestershire County Council decided to discontinue the work, partly owing to the spraying having failed to check the spread of the mildew on the leaves and shoots at several places, and partly owing to the possible danger in spraying the bushes with the sodium sulphide while the berries were ripening. Moreover, some difficulty was experienced in obtaining water and tubs from some of the growers, who did not believe that the fungus injured the bushes. It was then decided that as the young leaves and shoots were covered with the mildew, they should be cut off and burnt before all the leaves fell off, previous to the regular pruning in the following winter.

Accordingly, on 9th July, the Worcestershire County Council commenced to prune off and destroy all the shoots seen to be affected with the mildew. The work was begun at the plantation already referred to at Lenchwyck, where practically every shoot on each bush was more or less affected with the disease. The labour of pruning off every shoot from these bushes, which were very large, was considerable, and the work proceeded very slowly. As far as could be ascertained the mildew attacked the berries in the first instance, from which it spread in a few days to the leaves and wood of the shoots. The leaves were mostly attacked on the underside. It was noticed also that where the disease appeared on the tips of the shoots, the fruit even in those cases where it was not attacked was smaller in size than usual. The berries that were affected were most usually those growing near the

centre of the bushes, close to the old wood. At the plantation at Lenchwyck it was scarcely possible to recognize a large number of the berries, so thickly were they covered with the brown scurfy covering of the fungus ; and the owner, who had at first treated the disease as one not likely to cause any great damage, on seeing the mildew developed in full force in its summer stage, picked all the healthy berries that could be gathered and on his own initiative grubbed up the bushes without more ado.

Towards the end of July, some three weeks after the spraying had been stopped, the mildew began to make its appearance on the leaves and shoots at another of the plantations which had been sprayed regularly. This was the plantation already referred to at Pinvin (Pershore), where potassium sulphide had been first of all employed, and sodium sulphide later. This plantation was damp and dark owing to the dense foliage of the plum trees above the bushes. Shortly after this the leaves and shoots of the bushes in the plantation at Lenchwyck mentioned above as the place which had been sprayed the whole time with potassium sulphide alone were seen to be badly affected with the disease. In this case the bushes were planted in the open, with no trees above them ; the soil, however, was rather stiff. At both of these plantations the pruning and burning of the affected shoots had been most carefully carried out in the winter, the prunings as cut being placed in a basket and very shortly afterwards burnt. At three of the affected plantations where no spraying had been carried out the mildew was visible on the leaves and shoots at the beginning of August. It may be mentioned, however, that at ten of the thirteen plantations sprayed by the Worcestershire County Council, and at the outbreak to the north of Worcester where the spraying was carried out with potassium sulphide by the owner himself, there were no signs of mildew this summer.

RESULTS OF SPRAYING.—The weather during the period when the bushes were sprayed—namely, 26th March to 5th July —was undoubtedly most conducive to the spread of disease. It was extremely showery, and the soil and bushes were constantly wet, especially in the plantations where there were plum trees growing above the bushes. In these cases the

bushes were scarcely ever dry, owing to the showers that fell while spraying was carried out. In a large number of cases it was nearly impossible for the sun and air to penetrate the dense foliage above to the bushes below. It was, perhaps, fortunate in some respects that there was no hot sunny weather, as it would have been impossible, judging from previous evidence on the subject, to have used the wash at the strength at which it was used during the latter part of the period. According to information collected from the Continent and America, it appears that spraying with potassium sulphide is not only liable to injure certain varieties of gooseberries, so that the leaves and even the fruit fall off, but that it is insufficient to stop entirely the development of the fungus. Up to 8th July, when the spraying was concluded, no signs were observed of the leaves or berries falling off on account of the wash, although it was used at the rate of one and a half ounces of sodium sulphide to one gallon of water. At several plantations, however, rain fell in quantities immediately after the spraying had been completed, and before the leaves of the bushes had time to dry. On the other hand a slight increase of the strength of the sodium sulphide wash over the proportion last quoted when used on a few bushes as a test in one rather hot week caused some of the leaves to fall off, though no berries were affected.

The results of the spraying as a means of checking the disease may be described as not altogether satisfactory. Not only have bushes previously affected been attacked again in spite of all precautions, but bushes which last winter were believed to be free from disease have become affected in spite of careful pruning, followed by regular spraying. It is true that results apparently satisfactory have been given in certain cases, and it is surprising how few berries were attacked compared with the number of diseased shoots ; but it is clear that even pruning and spraying will not ensure immunity from the disease, and apart from the requirements of the law, growers would surely not prefer to prune their bushes hard, to spray six or seven times, and then get a crop tainted with disease, when by destroying totally and immediately all diseased bushes they can extirpate a pest which has but newly arrived, and has not yet shown its full power for evil.

THE CRICKET BAT WILLOW.

In recent years the supplies of willow adapted for the manufacture of cricket bats have become seriously limited, and prices have risen in proportion. At a sale of willow trees on Sir Walter Gilbey's estate at Sawbridgeworth, in February, 1906, the best "bat willow" realised prices estimated to be equivalent to about 7*s.* per cubic foot. The agent of a large estate in Essex is said to have declined an offer of £1,500 for the best 100 willows on the estate; and Mr. John Shaw, of the well-known firm of Shaw and Shrewsbury of Nottingham, last winter offered £40 for a single tree. When it is remembered that trees have been known in favourable situations to reach a saleable size in twelve years (having in that period attained a girth of about 50 inches) these prices show that there is no timber so profitable at the present time as that of the cricket-bat willow. It is not surprising, therefore, that the attention of owners of land suitable for the growth of willows should have been attracted by this tree. As a matter of fact a large number of willows have been planted during the last few years with a view to meeting the future demand. But we have it on the authority of Mr. Shaw, one of the largest buyers as well as a leading expert, that not more than one-fourth of the trees that are being planted are the best cricket-bat willow.

The identity of the true "bat willow" has always been obscure. The cricket bat maker recognises the tree best suited to his purpose with infallible certainty, but the characters on which he relies are not characters on which the botanist bases his distinctions. With a view to helping the planter to recognize the willow best suited for cricket bats, the matter has been investigated at the Royal Gardens, Kew, by Mr. W. J. Been, and the information available is published in the *Kew Bulletin, No.* 8, 1907.

The "Open-Bark" Willow (*Salix fragilis*, L.)—The two commonest terms used in describing willows from the bat-maker's standpoint are "open-bark" and "close-bark." There is no difficulty or mystery about the "open-bark." It is the Crack Willow—the *Salix fragilis* of Linnaeus—a common tree on the banks of the Thames near Kew. Although a useful

timber in other respects, it is of very inferior merit for the making of cricket bats. It is, in fact, used only for the manufacture of cheap bats for children.

The Best " Close-Bark " Willow (*Salix alba*, L. var. *caerulea*, Syme [*S. caerulea*, Smith].)—The willow selected by Mr. Shaw as the very best one for bat-making is a tree of markedly pyramidal habit ; it is female or seed-bearing ; and it belongs to the bluish-leaved variety of the white willow. It is, therefore, a pyramidal form of *Salix alba*, var. *caerulea* ♀. The bark is less rough than in *S. fragilis*, and the corrugations are less prominent, straighter, and more continuous up and down the trunk of the tree. The wood is white, and when it is being split does not part so easily as the " open-bark " does, but splinters a good deal. This splintering, or tearing, down the cleft is regarded as an evidence of good quality.

According to Mr. Shaw trees of this type are only to be found at the present time in the counties of Essex, Hertford, and Suffolk. A few trees were at one time growing in Kent and Surrey, but it is his belief that the true " bat willow " is no longer to be obtained there. Neither Cambridgeshire nor Lincolnshire has it, nor does it exist (except for recent plantings) north of the Trent. This all goes to show that this willow is a local form, and that only those " sets " can be relied on which have been obtained from the right district. *Salix alba*, var. *caerulea* ♀ is grown at Kew, where there are two fine specimens on the banks of the lake. But although in character of leaf and fruit they are identical with the typical trees selected by Mr. Shaw on the Copped Hall estate, in habit they are quite different. The trunks have forked low, and the habit is more spreading. Although some of the Copped Hall trees are growing in hedgerows and have ample room for lateral development, their tapering pyramidal form is a most noticeable characteristic. This is associated with, and may in some measure be due to, a great vigour of growth.

In regard to quality of timber for cricket bats, the typical *S. alba* appears to be intermediate between *S. alba* var. *caerulea* and *S. viridis* (see below). Botanically there is no well-marked dividing line between *S. alba* and *S. alba* var. *caerulea*, the two being united by intermediate forms. It is possible that the quality of timber improves as the tree approaches the latter.

Salix viridis, Fries.—There is another willow recognized by Mr. Shaw as a "close-bark" and of a useful quality, but still inferior to that of *Salix alba*, var. *caerulea*. Although it is not easy to put on paper the differences between the "open" bark of *S. fragilis* and the "close" bark of the true "bat willow" in such a way that they can be indubitably recognized, they are appreciated easily enough when seen in the field. But the differences between the two "close" barks, are by no means obvious to the uninitiated, though the trees are distinct enough in other respects. The habit of this second tree is more spreading than that of *S. alba*, var. *caerulea*; the leaf is smaller and not so blue; and the trees are presumably male. This tree is considered to be *Salix viridis*, Fries.

Salix viridis is a hybrid between *S. alba* and *S. fragilis* and as these species frequently grow together they have no doubt cross-bred very many times. It is quite probable also that the progeny have interbred with the parent species again. At any rate *Salix viridis* is a very variable tree, showing numerous intermediate gradations between the two parents—sometimes approaching *S. alba* and *S. alba*, var. *caerulea* so closely in leaf as to be indistinguishable from them, and sometimes showing very distinctly the influence of *S. fragilis*. Its advent into the cricket-bat willow question has created a good deal of confusion. A specimen approaching *S. alba*, var. *caerulea* may be described as good by the bat-making expert, whereas another approaching *S. fragilis* will be accounted inferior. Yet to the botanist both are *S. viridis*.

From the bat-maker's point of view the timber of *Salix viridis* is not so good as that of *S. alba*, var. *caerulea* because the wood is coarser and heavier. A bat made of good *S. viridis* timber would weigh about 2 lb. 7 oz. to the 2 lb. 4 oz. of *S. alba*, var. *caerulea*. The difference in market value is also so considerable as to be important to intending planters. Mr. Shaw stated that, for trees of equal size, buyers would give £10 for the *S. alba*, var. *caerulea*, but only £6 for the *S. viridis*.

Salix Russelliana, Smith.—In connection with the "bat willow" question the name of *Salix Russelliana* frequently crops up, and is a source of considerable confusion. A correspondent of Kew complains that whilst one person tells him that *Salix Russelliana* is an excellent willow for bat-making,

another says that it is quite worthless. The probable explanation of this is that "Russelliana" is a name that has been given to two different willows. Most commonly it has been applied to the "crack willow" (*S. fragilis*); in that connection, therefore, it indicates the very inferior willow for bat-making. But the name has also been given to the hybrid between *Salix alba* and *S. fragilis* which, as has already been explained, is itself a variable plant, but is often of good, although not the best, quality. The name "Russelliana" is now no longer used by the leading authorities on British willows, so that those interested in the cricket-bat willows would do well to discontinue its use.

Popular and Local Names.—Another source of confusion arises from the use of local names. So misleading are they, that they should be dispensed with altogether in connection with the present question, since it is hopeless now to find one popular name restricted to one particular willow. A name given to a particular species or variety may be in general use in one district, but it may be given to quite a different tree in another. The terms "Huntingdon willow" and "Leicestershire willow" have both been applied to *Salix alba,* to *Salix alba,* var. *caerulea,* and to *Salix fragilis.*

Propagation and Cultivation.—It will have been gathered from what has been said that there is at the present time a brisk demand for young trees or "sets" of the true "bat willow." Inquiries are being continually addressed to Kew as to where they can be obtained, but no one is known at the present time who is able and willing to supply them in quantity. It is of little use applying to the ordinary trade firms. With the best will and the most honest intentions they may supply the wrong tree, because, as has already been pointed out, it is not *Salix alba* var. *caerulea* merely that is wanted.

So far as our present knowledge takes us, it is the erect-growing form alone that can be relied on, and then possibly the female plant only, and it is only safe to plant stock which has come originally from the counties of Essex, Suffolk, or Herts.

The usual method of propagating this willow is by means of "sets." These "sets" are branches cut as thick as, or thicker than a broom-handle, with the minor branches and twigs removed; they are thus transformed into bare rods which,

when planted, are 8 to 10 ft. or even more in length. "Sets" of about this length are preferred, so that the young growths may be out of reach of cattle, &c., and the young trees away from the various dangers that beset them when they are near the ground. They are also suitable for thrusting in hedgerows and such like situations. Care should be taken to prevent cattle from injuring the stems. In some places willows are being pollarded for the especial purpose of producing "sets" of the desired size.

The willow is one of the most easily propagated of all trees, for every twig will grow, and the use of cuttings made of shoots as thick as a goose-quill and, say, 1 ft. long, is recommended. Cuttings of this character, planted in the Arboretum nursery at Kew in the spring, were 6 ft. high in August. For thicker wood the cuttings may be proportionately longer. These can be put in the ground in autumn or early spring. As they grow it would be necessary to keep them each to a single leader and to prune back the side branches and remove the lower ones as the plants grow in height. In well-kept nursery ground fine healthy plants could be produced in two or three seasons, and they could be grown to planting-out size at the rate of 8,000 or more to the acre.

Whilst these willows like abundant moisture, a position by the side of water is not necessary. Fine specimens are grown in deep, rather heavy clay, with only an ordinary hedge-row ditch on one side, and timber grown in such a position is preferred to that of trees growing close to the edge of ponds, &c.

Young trees should be watched to see that they are kept to a single leading shoot. This will obviate the forking of the trunk low down, which, of course, detracts from the value of the tree by reducing the amount of good timber. Trees, however, are more liable to fork when growing in isolated positions than they are when close together in plantations.

The article in the *Kew Bulletin* is illustrated and contains a botanical description of the willows considered.

POTATO LEAF-CURL.

WALTER P. WRIGHT.

Potato Leaf-curl (*Macrosporium solani*) is a disease which is causing great trouble to growers in many parts of the country, but particularly to those in the south of England. The indications of the disease are generally well known and a description of their more important features is given in the Board's Leaflet on the subject (No. 164). The shoots come through the soil very slowly, and frequently there are numerous gaps in the rows. The foliage is very small, and the leaflets are much curled. In rare cases the plant improves, and gives a moderate crop, but in the great majority, it remained stunted, and the rows fail to fill out. In most attacks of curl the seed tuber fails to decay, and remains perfectly hard. The crop is very small, often consisting merely of three or four tiny tubers.

Treatment of Seed.—Wherever curl has given trouble special consideration should be given to the question of the stock of seed to be used in the following year. If seed produced at home is to be utilized, special treatment should be given to it. The seed should be carefully selected immediately it is lifted in the autumn, sound, fairly large tubers of two to three ounces in weight being preferred to very small ones. In no case should it be put away in a clamp and left until planting time the following spring. The sets should be stored in shallow boxes in a cool building, not too dry, but frost-proof. Southern growers put the potatoes singly in the boxes, standing them on end with the principal eyes uppermost. Certain of the Scottish dealers, however, prefer to put the sets on their sides three or four layers deep. It might be thought that the advantage gained in being able to store a larger quantity by the latter plan would be lost in the weaker growth that would be made ; the sprouts on the lower layers are, in fact, much weaker and looser than those on the upper, but having handled a considerable number of boxes so treated, the writer finds that when the sets are ultimately laid out, the sprouts quickly harden and stiffen, giving quite satisfactory plants.

In the case of early varieties there should be decided signs

of growth by February at the latest, and in a mild winter shoots will be showing before Christmas. If no indications of growth appear by March, a number of sets should be taken from different boxes, and the lower part cut off; it will be found, probably, that there is a brownish streak or ring permeating the flesh, and if this is general the stock should be rejected without hesitation.

It is important to consider the possibility of the sets being infected before planting so that time and money may not be spent in the preparation of ground that cannot possibly give a satisfactory crop. Growth in the seed tuber in the store is not, it is true, certain evidence of full vitality. The writer has had instances of curl attacking a crop when the seed employed had shown satisfactory signs of vigour in the boxes, but this points to the presence of fungus spores in the soil or in the tuber as hybernating mycelium.* Treatment of the seed, however, on the lines indicated favours the chance of a good crop, even if it does not absolutely ensure it in all instances.

Change of Seed.—Experience shows that cases of failure are most common and most severe where stocks of the same seed have been held year after year. These stocks will frequently sprout in the store, but will fail to resist any disadvantageous circumstances, such as chilled soil or lurking spores, out of doors. The superior vigour which fresh stocks possess gives them a better chance of battling with natural disadvantages. I have made some experiments with a view to proving the advantages of change (1) by planting home stocks which have made good growth in the store, in ground from which a "curled" crop had been taken the previous year, and (2) by planting on similar ground corresponding seed from a fresh source. The former has been badly curled, and the latter completely immune. This is an example of the fact that thoroughly vigorous stocks of seeds are capable of resisting the risk of contagion. They are also able to overcome in some degree such natural disadvantages as poverty of soil and unsuitability of position.

Over-maturity.—It is only within comparatively recent years that the question of over-maturity has been treated as

* Cf. *Journal of the Board of Agriculture*, Vol. xiii, August, 1906, p. 257.

seriously as it deserves. From the first re-appearance of curl some ten years ago, growers have suspected over ripeness as being largely responsible, but it did not occur to them at once to make comparative tests. When these were carefully conducted it was found that immature seed gave more vigorous plants than did ripe seed. In point of fact, there can be very little doubt but that a considerable measure of the success of Scottish seed is due to absence of complete ripeness. In Scotland, with its comparatively cool and humid climate, the plants continue growing until they are cut by frost, and it frequently happens that the first visitation of frost comes while the leaves are still green. Those who have had opportunities of going over the seed potato stores of some of the principal Scottish dealers will have observed the great proportion of rubbed tubers, which give clear evidence of the fact that when they were taken up they were unripe and the skins unset. It would not be safe to argue from this that immaturity is everything, and that south of England growers have nothing to do but to lift a portion of their crop for seed purposes while still in full growth in order to secure heavy crops. They would certainly be wise, however, to make experiments. A few trials conducted with care might give convincing proof of the real value of immature seed.

The Soil.—We may now turn to the question of the soil. This is of almost equal importance with the seed. That a fresh, vigorous stock may give fairly satisfactory results, even where the ground is not of the best, and where the general circumstances are unfavourable, is acknowledged. But if such unfavourable conditions are maintained year after year the stock will lose its vigour much more rapidly than it would do if proper conditions were provided for it. Unquestionably the first essential in the soil is an adequate supply of moisture, but if a site is chosen which would be saturated in a wet season the potatoes will be liable to disease in the form of *Phytophthora infestans*, which will cause the grower a loss quite as severe as that accruing from curl. The moisture of a wet site is not the moisture which is required in order to keep potatoes free from curl. It is rather the moisture of the deeply worked, well-tilled soil. Land that is thoroughly prepared and regularly cultivated throughout the growing

season will hold considerably more moisture than shallow, badly cultivated land. In large cultures watering is not practicable, but in special cases it might be worth while to water previous to earthing. Earthing with the ground in a dry and lumpy state is bad, because it surrounds the tubers and plant with a medium from which moisture rapidly evaporates. Growers should lose no opportunity of seizing a favourable moment for earthing. Directly rain comes the soil between the rows should be crumbled up and drawn up to the plants.

It is not clear that any special course of manuring can be relied upon to exert much influence in checking curl. Certainly the practice of spreading dry manure in the drills and placing the sets in direct contact with it is to be deprecated. This material does not retain moisture, and becomes like so much hay round the plants. Manure from cowyards should be used much more extensively than it is at the present time. It is true that it does not come out very well under analysis, but its mechanical value must be considered, and any want of nourishing properties can be easily made up by the addition of well chosen chemical fertilizers. Kainit has been found of considerable value; its caustic action is inimical to the spores of the fungus, and the potash salts which it contains stimulate the crop. Kainit is very cheap, and may be used at the rate of 7 cwts. per acre towards the end of winter. The application of Bordeaux mixture cannot be relied on to check curl.

The principal points connected with Potato Leaf-curl may be stated thus :—

1. *The Disease.*—(*a*) The disease is caused by the fungus, *Macrosporium solani*; (*b*) the base of the haulm is generally the part first infected, but the fungus may establish itself in the young sprouts; (*c*) the mycelium spreads upwards in the haulm, and downwards to the tuber, in which brownish streaks may be found; (*d*) the ascent of sap for the nourishment of the plant is checked by the spread of the mycelium, and consequently the plant becomes unhealthy; (*e*) the disease may be carried in the seed tuber, or spread by means of fungus spores in the soil; (*f*) at a later stage of the disease numerous olive brown conidia form on the surface of the leaves, causing dark patches.

2. *Indications of Disease.*—(*a*) Thin "gappy" rows; (*b*) puny haulm; (*c*) small curled leaves; (*d*) non-decay of the seed tuber; (*e*) a poor crop.

3. *Predisposing Causes of the Disease.*—(*a*) Worn out seed stocks; (*b*) drought.

4. *Preventive Measures.*—(*a*) Seed selection and preparation; (*b*) change of seed stock; (*c*) adequate moisture; (*d*) experiments with immature seed; (*e*) destruction by fire of any diseased sets, leaves, or haulm; (*f*) dressing the ground with kainit.

THE TRANSPORT OF SUSSEX POULTRY.

J. W. HURST.

The whole question of transport is one which materially affects an industry such as poultry production, in which the unit of production is so comparatively insignificant. Whilst in some cases the facilities are sufficiently favourable for a reasonable margin of profit, their absence in other instances kills production in its inception. It is no doubt true that one of the dominant economic facts of our age is the development of the transport industries, but it must not be forgotten that the cheapening of transport in general has been to the disadvantage of such an industry as that of East Sussex, owing to the increased facilities it has afforded far-distant competitors, without any corresponding adequate advantage to Sussex producers. In other districts also, where the output has been too small to admit of special concessions (similar to those obtainable in such an extensive trade as that of Sussex), the cheapening of transport has, by benefiting the large consignors or combinations of consignors, left the smaller and scattered producers in a still more hopeless and helpless condition than was formerly the case. From the carrier's point of view it is of course primarily a question of the difference between wholesale and retail.

So far, economic progress has been exceptionally favourable to the marketers of produce from a distance, but the advantages of home producers are in many other ways very great, and, could they but escape some of the supplementary costs at

present incurred in marketing, they should be able to hold their own against distant competitors, despite the disparity in the prime cost of production.

As the industry of East Sussex is practically the only naturally organised poultry industry (developed from self-interest) of any considerable importance in the British Isles, it may be worth while to inquire into some of the details of its transport arrangements.

Local Collection.—In the infancy of the industry (and even now in some cases of small individual commencement) the collection of lean chickens, reared within a limited radius of the fattener's establishment, was made by men travelling on foot and carrying on their backs double-decked willow-made back-crates. Generally speaking this slow and expensive method has given place to collection by van or cart, with a consequent enlargement of the rearing area. The rearers, however, who are situated in the extreme outlying districts are usually paid from 1*d.* to 3*d.* per bird less in order to balance the increased cost of collection from a distance. It is almost impossible to apportion the cost of this direct collecting as regards the increased cost of the individual bird to the fattener, especially in view of the wide difference between the numbers collected in summer and winter and the discrepancy in their values. The gross cost is, of course, that of the keep and upkeep of horse and van, plus the wages of the collector; but a part of this is usually apportionable to other and incidental occupations.

Transport from Ireland.—During the twelve months ending October, 1906, the fatteners of East Sussex paid within a few pounds of £5,000 for the carriage of live chickens from Ireland, paying at the rate of £7 per ton upon a total weight of 713 tons. Here again the proportion of increase, supplementary to the prime cost of the individual bird, is a variable quantity; probably averaging in most cases about 3*d.* each, but not infrequently working out at as much as 4½*d.* and even 5*d.* per bird—the bird being lean and, therefore, an unfinished article of commerce.

The Irish exporters mostly buy their birds in the markets and ship them to Sussex in "tops," viz., heavy flat wooden crates, holding about forty-two birds in each. The "tops"

themselves average rather more than three-quarters of a cwt. in weight, so that if we take the weight of the chickens at from about $2\frac{1}{3}$ to $2\frac{1}{2}$ lb. it will be seen that the weight of the crate very nearly doubles the cost of the carriage of the birds. The consignments take about twelve hours in transit, arriving at the Sussex stations in the early morning.

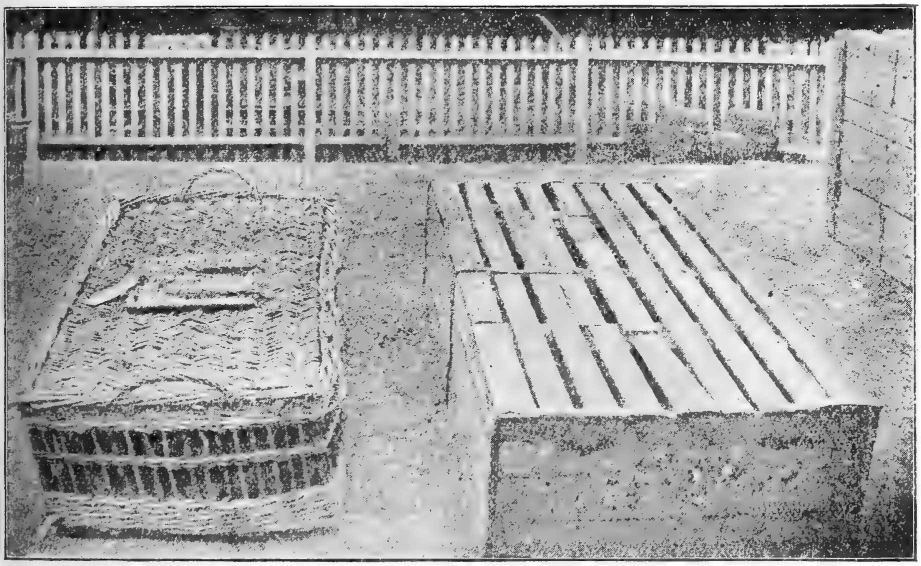
Transport from Wales.—The amount paid for the carriage of lean Welsh chickens into Sussex is insignificant in comparison with the imports from Ireland. The through rate from Wales to Sussex (Uckfield Station) ranges from 5*s.* to 5*s.* 3*d.* per cwt., and last year's total was no more than 26 tons from that source. This appears at first sight to be an unaccountable drop from the 40 tons of two years ago, but the lower quantity is partly accounted for by the fact that the import agents are not now bringing in any birds for the supply of their own fattening coops, as they did previously. There is, however, another fact to be noted in this connection, and one which particularly concerns the subject of transport, viz., the adoption of a crate of lighter construction, which makes a considerable difference in the gross annual returns.

Whereas the Welsh chickens had previously been conveyed in wooden "tops," very similar to those used in the Irish trade, they are now carried in wicker "flats" or hampers. The old style Welsh "tops" weighed about three-quarters of a cwt. and carried forty fowls; the new "flats" weigh about half a cwt. and hold thirty-six fowls. So that, although the quantity contained in each is reduced by four, there is an approximate saving of about 28 lb. in the weight of the crate or hamper; which the agents roughly estimate to make a difference of about 1*d.* in the supplementary cost of the chickens, reducing the cost of carriage per bird from 3*d.* to 2*d.* Against this it must be noted that "flats" are more expensive than "tops" in the first instance, and naturally have not such a long life. As in the case of the Irish fowls, the transit of the Welsh is effected during the night, and the consignments arrive at their Sussex destination in the early morning.

The Outward Traffic.—Having secured what may be termed the raw material, by collecting and bringing in the lean chickens from all available quarters, the fatteners have by no means finished with transport and charges. After undergoing the

fattening process the fat birds, which constitute the finished article, must be conveyed to market at a further addition to the supplementary cost.

The conduct of this section of the work is almost entirely in the hands of two firms of carriers, working from two centres of railway departure. The dead poultry is forwarded in "pads" or crates made with willow frames and staves and lined with deal board; the usual sizes are to hold 12, 16, 20, or 24 fowls. The pads are strong and not unduly heavy for their purpose and constant transit, but the consignor does not



"FLAT" AND "TOP" USED FOR CONVEYANCE OF POULTRY.

concern himself with the question of weight, paying for the carriage to market according to the number of fowls sent. The carriers charge a uniform rate of 1*d.* per bird, this charge covering the transport by road and rail from the fattener's establishment to the salesman's stall in the market, and the return of all empties. As a matter of fact this charge is not paid by the consignor direct, but is paid on his account and deducted, together with the commission, by the market salesman.

The carriers have an arrangement with the railway company by which special poultry vans leave the local stations attached to passenger trains, and the railway charges are settled between

the company and the carriers on the basis of 20*s*. per ton, inclusive of prompt delivery to market at the London end. By conveying the poultry in large lots the carriers, and consequently the producers of small as well as large quantities, obtain the full advantage of the railway company's special concession in favour of this particular local trade, in connection with which they have drawn out a special tariff. This tariff commences with a rate for the first cwt. of 2*s*., which finally becomes halved in the 15*s*. rate for 15 cwt., so that it is safe to say that practically the whole output pays no more than 1*s*. per cwt. for conveyance by rail. Independent consignments forwarded by passenger train otherwise than in the special vans are charged at ordinary passenger rates and delivery charges.

The regular poultry vans leave the local stations in the evening, and the pads of dead poultry are delivered in London in time for the following early morning markets. This outward traffic in fattened fowls, collected and forwarded by the recognised carriers, approximates to a total weight of 2,200 tons per annum.

THE PRODUCTION OF WOOL IN GREAT BRITAIN.

In view of the renewed importance which the recovery in price in recent years has given to the supply of British wool, and having regard to representations received as to the deficiency of official information on the subject, the Board have thought it desirable to make an attempt to obtain more definite particulars than have hitherto been available of the production of wool by different breeds of sheep throughout the country. The assistance of its Agricultural Correspondents and Market Reporters, as well as of a large number of flock-masters and wool buyers in different localities, was invoked, and a considerable amount of information has been received. This has now been printed as a separate Report, and may be obtained from Wyman & Sons, Limited, Fetter Lane, E.C. Price 4*d*.

County Returns.—The estimates made by flock-masters throughout Great Britain of the yield of wool in their own localities form the basis of the estimate, and figures are given of the average weight of the fleece and total quantity of wool produced for each county, and of the estimated average weight per fleece

of the principal breeds. A considerable amount of information was obtained relating to the breeds of sheep kept in different districts, and these are summarized in the Report so as to present as far as possible a brief account of the wool-growing capabilities of each county. Wool buyers also were requested to furnish particulars as to the counties or districts whence they obtained their supplies, and the details which they supplied serve to some extent as a check on the county figures.

Breeds of Sheep for which Estimates are given.—The information which was obtained as to the variety of breeds of sheep kept in Great Britain affords some index to their relative importance in particular counties. It cannot, however, be regarded as exhaustive, and although it may perhaps be regarded as fairly approximating to a general survey of the country, it is insufficient to furnish a statistical basis for a "census of breeds." In many counties the estimates furnished of the proportions of the predominant breeds approach practical certainty, but in others they are evidently incomplete.

The number of separate breeds for which estimates of wool-production have been supplied from one or more counties in Great Britain is 29, and the complete list is as follows:—

Blackfaced	Leicester
Border Leicester	Lincoln
Cheviot	Lonk
Clun	Orkney
Cotswold	Oxford Down
Dartmoor	Radnor
Devon Longwool	Ryeland
Dorset Down	Shetland
Dorset Horn	Shropshire
Exmoor	South Devon
Hampshire	Southdown
Herdwick	Suffolk
Irish	Welsh Mountain
Kent or Romney Marsh	Wensleydale
Kerry	

It would seem that the most widely distributed breeds are the Blackfaced and Cheviots, which are not only kept in the majority of Scottish counties, but also figure in the returns from several English counties. The same may be said in a somewhat less degree of the Border Leicester, so that the Scottish admixture in English flocks appears to have attained considerable proportions. Of the English breeds, five are prominent by reason of the number of counties from which estimates of their wool-bearing capabilities are supplied, viz., Hampshires, Shropshires, Oxford Downs, Southdowns, and Lincolns.

Before proceeding to estimate the production from the figures thus obtained, a summary of previous estimates is given in the Report, and it is interesting to notice that the estimate made by the *Yorkshire Observer* for the year 1905 was 130,529,000 lb., and for 1906, 130,176,000 lb.

Estimate of Wool Production.—The basis of any estimate of wool production is of course the number of sheep returned in each year on 4th June. It is evident that all the sheep then returned as one year and above may each be reckoned as contributing what may be termed a normal fleece in that year. Thus the average number of sheep of one year and above returned in 1905 and 1906 in Great Britain being 9,998,400 breeding ewes and 5,123,200 other sheep, and the average weight of fleece being estimated at $5\frac{3}{8}$ lb. and $6\frac{1}{2}$ lb., respectively, the total amount of wool furnished by them would be 87,838,000 lb. But there are two further sources of supply. When sheep are slaughtered the wool then on their backs, which is more or less according to the period which has elapsed since they were shorn, is brought into contribution. The number of sheep slaughtered between one enumeration and another can be calculated from the returns with reasonable accuracy, and during the two years from June, 1904, to June, 1906, it is estimated as 11,000,000. If the average weight of a "skin fleece" be estimated at $2\frac{3}{4}$ lb. the quantity of wool thus available is 30,250,000 lb. The other source of supply is lambs' wool, as to which the information available is somewhat scanty. From the references made in the growers' returns it appears that in the South-west of England many lambs are shorn and in most of the counties south of the Trent the practice seems more or less adopted. There is, however, very little information on which to found an estimate of its prevalence. In Wales several correspondents mention the shearing of lambs and one of the wool-buyers states that Welsh lambs are generally shorn. The number of lambs' fleeces which passed through the hands of buyers furnishing returns was rather more than 5 per cent. of the total number. On the whole it would appear that an estimate of 2,000,000 lb. from living lambs and 1,000,000 lb. from slaughtered lambs may be reasonably adopted.

The specific enquiries of the Board extended only to Great Britain, and application was made to the Department of

Agriculture and Technical Instruction for Ireland for a statement of the wool production of that country. The estimated quantity produced on the average of 1905 and 1906 was 12,000,000 lb. As regards the relative numbers of different breeds, it is stated that Blackfaced Mountain and their crosses (Border Leicesters and Shropshires) predominate, then come Border Leicesters and their crosses, then Roscommons and their crosses, Shropshires and their crosses, and a comparatively small number of Cheviots and Oxford Downs. Hampshires and Southdowns are only kept by one or two show breeders in Leinster.

Taking the average of the returns received for the two years 1905 and 1906 the following may be regarded as an approximate estimate of the total production of wool per annum in the United Kingdom :—

	Lb.
Sheep shorn...	87,838,000
,, slaughtered	30,250,000
Lambs shorn	2,000,000
,, slaughtered	1,000,000
Total for Great Britain	121,088,000
,, Ireland	12,000.000
,, United Kingdom	133,088,000

The average quantity of imported wool (sheep's, lambs', and alpaca) retained for home consumption in the two years 1905–6 was 360,000,000 lb. Of the total supply of raw wool used in this country, therefore, it appears that British and Irish flock-masters are responsible for about 27 per cent.

Notes on Insect, Fungus and Other Pests.*

Although a large number of specimens have been submitted during the past few weeks, the pests identified are chiefly species which have already been dealt with in this *Journal* or in the Board's Leaflets.

MOTHS.—Specimens of Scots pine and Austrian pine were received from Oakham during August, and were found to be attacked by a small

* Notes on insect, fungus and other pests, dealing with the specimens submitted to the Board for identification, and their apparent prevalence, will appear in this *Journal* month by month. The notes commenced with the issue for June, 1907.

moth of the genus *Retinia.* The caterpillars tunnel in both buds and terminal and side shoots. Young growth alone is attacked. The best method of treatment consists in hand-picking and burning the affected shoots. The moths of *Retinia buoliana* lay eggs towards the end of June and in July. The resulting caterpillars feed from August to October, and hibernate from November to March. They resume feeding in April and May, and then pupate, the moths from the pupæ proceeding to egg-laying towards the end of June, as before. The life history of *R. turionana* is similar.

SAWFLIES, &c.—From Luton the Board received in August specimens of oak leaves, the backs of which were covered with the galls made by the little hymenopterous insect, *Neuroterus lenticularis.* The life history of this insect is very interesting, because two generations and two kinds of gall are produced in the year.

The galls produced later in the year yield in spring the small insect *N. lenticularis,* which pricks the buds of the oak and lays eggs in them. As these develop, a roundish and greenish gall appears not only on the leaf of the oak but also on the flower stalks of the male inflorescences. In June, male and female insects issue from these galls (known as *Spathegaster baccarum*), and after pairing lay eggs in the leaves of the oak, which in their turn produce galls. These are quite different in appearance from the earlier galls, and are those which yield in the following spring the insect *N. lenticularis.*

CORN SAWFLY.—Wheat specimens sent from Grantham were found to be infested by the corn sawfly—*Cephus pygmaeus.* The Board's correspondent remarked on the thinness of the crop and the fact that it was badly laid. This is the result of the work of the larvæ of the sawfly. The adult sawflies appear in summer. They are small dark-coloured insects, bearing yellow spots. The females pierce the stems of the attacked crop (wheat, and sometimes barley) and lay an egg at each place of puncture. The grub that hatches tunnels in the stem, and when full grown passes to the lower part of it and bites round the stem in a circle, so that the slightest wind makes the stem topple over at that place. Below this (further down the inside of the stalk or stem, *i.e.,* in the stubble) the grub makes a cocoon and lies sheltered until the next season, when it becomes a fly.

In combating this insect the vulnerable stage is the resting stage, when the grubs are in the stubble after the crop has been harvested. Where attack has been bad the stubble should, if practicable, be burnt over, or removed and burnt, with the result that the full grown grubs are destroyed. Burying the stubble would only be efficient if it were turned in deep enough to prevent the sawflies on development from reaching the surface.

Other sawflies submitted to the Board included specimens of apples from Swanage infested by the apple sawfly, an account of which appears on p. 482 of this *Journal;* and larvæ of the pear sawfly from Wallingford, where they were infesting damson and cherry trees. This pest is dealt with in Leaflet No. 62.

MITES.—Specimens of begonias from Bath were found to be infested with the Begonia mite, *Tarsonymus*. This mite does not confine its attack to begonias, some species of which seem to be more susceptible than others, but also infests a number of other plants. The mite was determined by Mr. Michael and reported in the *Gardeners' Chronicle* for 16th November, 1895. Closely allied species have on occasion done much harm to box and to sugar cane.

With begonias the pest seems to be held in check if the plants are dusted with tobacco powder. Tobacco water and fumigating with tobacco are also favourably mentioned. Against the pest on sugar cane Mr. Michael recommended powdered sulphur in soap and water to be applied at intervals, because eggs may escape the first treatment. Sulphur is a well-known treatment for mites generally, the treatment recommended for the black currant mite being to dust the plants with a mixture of two parts of sulphur to one part of finely ground unslaked lime. The begonia mite spreads very rapidly where the cultural conditions favour it, and the increase is especially marked when the plants are allowed to become too dry. A case is known in which the mite, at one time a great pest, is now easily kept in check by the thorough and repeated syringing of the plants with clean water.

Specimens of black currants infested with the black currant mite (Leaflet No. 1) were received from Worcester.

Among other pests found attacking specimens submitted

for examination were pea weevil (Leaflet No. 19), on peas from Riston (Berwickshire); celery fly (Leaflet No. 35), from Romsey and Ventnor; frit fly (see *Journal*, August, 1907), on oats from Kettering; aphides, on larch, spruce and pines from Stamford, Penicuik (Mid-Lothian), Oakham, Marlow, and Ross (Herefordshire); woolly aphis (Leaflet No. 34), on apple from Marlow, Warminster, Amersham, Glasgow and Ross; aphides on currants (Leaflet No. 68), from Marlow and Worcester; on plums, from Riston (Berwickshire); and on turnips from Rugeley; and lecanium scale (see *Journal*, June, 1907, p. 162) on currant bushes, from Amersham.

FUNGI.—As usual, the number of specimens attacked by fungi covered a wide selection of fruit trees and farm and garden crops.

Diseased Wheat.—Specimens of wheat from Wellingborough were infested by the fungus *Helminthosporium gramineum*, Rabh., which causes "blindness" in barley, oats, wheat and some wild grasses. A short note on this disease was given on p. 416 of this *Journal* for last month, while an article on the subject appeared in Vol. xii, p. 347, September, 1905. It may be remaked here that lucerne and similar crops are not attacked by this fungus, and could not be in any way responsible for the diseased wheat.

Diseased Black Currants.—Black currant leaves from Westbury (Wilts) were covered with the teleutospores or winter spores of *Cronartium ribicola*, Deitr. The aecidium condition of the fungus occurs as a destructive parasite on branches of the Weymouth pine (*Pinus strobus*, L.), while it also attacks *Pinus lambertiana*, Dougl., *P. cembra*, L., and *P. monticola*, Dougl. The stage growing on conifers was at one time considered a distinct species and was known as *Peridermium strobi*, Kleb.

The teleutospore and uredospore stages also occur on leaves of red currant, gooseberry, *Ribes aureum* and *R. irrigum*. There is a difference of opinion as to whether the teleutospore stage can perpetuate itself on currant leaves without the intervention of the aecidium condition.

The fungus is rare in this country, but the injury it does to conifers on the Continent is of considerable economic importance. *C. ribicola* has recently been recorded on red currant

leaves from the United States, where its presence caused some anxiety, on account of the proximity of pine forests (N.Y. Agric. Expt. Sta., Bull. No. 2).

Potato Disease on Tomatoes.—A correspondent has lost some 50 tons of tomatoes grown in the open air, out of a total of 70 tons, owing to the plants being attacked by *Phytophthora infestans,* the disease which is so harmful to potatoes. Bordeaux mixture used against *P. infestans* on potatoes would be of equal value against the same fungus on tomatoes. The Bordeaux mixture prepared with lime should be used.

As tomato foliage is somewhat softer than that of the potato, more water should be added to the solution in order to prevent scorching. The proper strength can only be found by experiments made on the spot. If the spraying is well done the mildew should be destroyed long before the fruit is set ; and spraying should be done in anticipation of the disease and not be delayed until it appears. Under any circumstances spraying must cease soon after the first fruits are set.

Diseased Tomatoes.—Another disease of tomatoes, which was found on specimens sent from Palmer's Green, N., is *Cladosporium fulvum,* Cke. Spraying with half-strength Bordeaux mixture has been found the most effective treatment up to the time the flowers expand. Afterwards, if necessary, the plants may be sprayed with a solution of potassium sulphide, 1 oz. in 3 gallons of water.

Celery Leaf-Scorch.—Specimens of celery forwarded from Welwyn were infested by the disease known as celery leaf-scorch, caused by *Septoria petroselini,* Desm. This was at the end of September, when it was too late in the season to spray with any advantage, but all diseased leaves should be collected and burnt. In the spring, when celery is commencing growth, the plants should be sprayed with a solution of potassium sulphide, 2 oz. in 3 gallons of water.

Preserving a Decaying Tree.—A London correspondent inquires how to preserve a decaying tree, several of the branches of which have died, while rotting extends down the trunk to the ground. When a tree is not so far decayed that it is practically past recovery, all, or as much as possible, of the decayed wood and branches should be cut out. All the wounds made should be given a coating of coal tar. If the tree be growing on

a lawn with grass up to the trunk the grass should be removed, leaving a clear space round the trunk. The size of this space must depend on the size of the tree, but it should extend to at least 3 to 5 ft. away from the trunk. The space should then be kept hoed and free from weeds. By giving water and manure the development of new wood and bark is encouraged.

Among other specimens submitted to the Board the following fungus diseases were identified: Pear scab (Leaflet No. 131), on pears from Rugeley, Warminster and London; apple tree mildew (see *Journal*, September, 1907, p. 358), on apple twigs from Bourne End (Bucks); European gooseberry mildew (Leaflet No. 52), on gooseberry leaves from Ross; sclerotium disease (Leaflet No. 127), on tomatoes from Tewkesbury, and cucumber and melon leaf blotch (Leaflet No. 76), on marrows from Northampton.

The Apple Sawfly.

Many are familiar with the 16-legged, brown-headed, flesh-coloured caterpillar of the Codling Moth and with its destructive work in apples. Less well known are the pale or white caterpillars of the Apple Sawfly (*Hoplocampa* (*Tenthredo*) *testudinea*), and yet these caterpillars are in some years extremely destructive to young apples, accomplishing, in some cases, the loss of the whole crop.

The Sawfly Caterpillars, in feeding, hollow out the young apples or make irregular tunnels in them. The apples, as a result, fall away, their presence on the ground, below the plants, being a sign that the pest is at work.

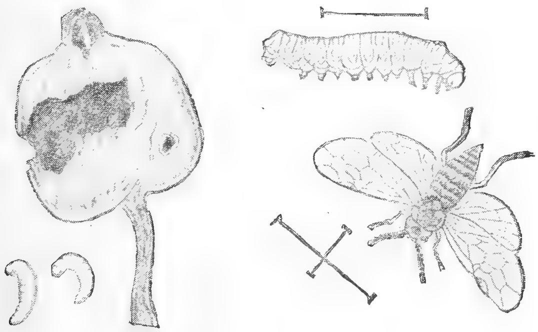
The Apple Sawfly has been recorded from widely separated districts in England; while on the Continent, its distribution is given by Cameron as Sweden, Germany, France, Holland.

Description.—The adult Sawfly is reddish-yellow in colour, with the top of the head, the body between the wings and the upper surface of the abdomen black. The top of the head and the body between the wings show fine punctures. The antennæ are yellowish, the middle joints having their upper surface somewhat darker. The wings are clear like glass,

with the veins at the base dark, as is also a spot about the middle part of the edge of each fore-wing.

The Sawfly measures in length one-quarter of an inch, and in spread of wings five-eighths of an inch. The caterpillar is white or cream-coloured; when first hatched it has a black head and a black plate at the tail end, later the head is red-brown and the tail plate greyish. The legs are 20 in number. The caterpillar, when full-grown, measures half an inch in length.

Life History.—The adult Sawflies begin to issue from their cocoons from about the middle of May onwards. Those issuing early may be found and in numbers amongst the apple blossom; the blossom may have fallen and the young apples



FEMALE SAWFLY AND CATERPILLAR (MAGNIFIED), AFTER WESTWOOD. INJURED APPLE AND CATERPILLARS (NATURAL SIZE), FROM MISS ORMEROD'S "HANDBOOK OF ORCHARD INSECTS."

may have made a certain amount of growth before the later issuing adults have appeared.

The female—as described by one of Miss Ormerod's correspondents—inserts her eggs below the calyx in the position of the ovary and developing fruit; the caterpillar, on hatching, feeds on the young fruit and may pass from one apple to another. As a result, badly infested apples "having reached the size of a walnut," fall away. In bad attacks the ground may be strewn with these. The full-grown caterpillars fall with the spoilt apples or may drop from the fruit, passing, in June and July, into the soil, where, some inches below the surface, they spin their cocoons. In the cocoons the caterpillar lies sheltered over the winter. In the late spring or early summer the caterpillars pupate and the adults come away.

Treatment.—1. Handpicking the Sawflies from the blossom or shaking them down in dull weather or in the evening and then destroying them. Where the attack is on plants that are not very tall this measure is quite a practicable one; it will reduce the egg-laying and will militate against the brood for the next year.

2. All infested apples should be picked from the trees, and burnt.

3. All the small attacked apples that have fallen away of themselves should be collected and burnt.

The last two measures, when the Sawfly has been noticed at work, should be practised at regular intervals.

R. STEWART MACDOUGALL.

Red Fife Wheat.

The experiments which are being made by the Home-Grown Wheat Committee of the National Association of Millers with a view of testing the strength of wheats are gradually being restricted to Red Fife, as it is evident that this sort is able to maintain its excellent qualities when cultivated in England. A preliminary report on the results obtained in 1906 appeared in this *Journal*, November, 1906, but some further particulars have now been published by the Committee.

Yield per Acre.—The yield of grain per acre in 1906 was variable, the highest being 52 bushels per acre and the lowest 21½. Fife invariably has small ears, and does not appear when growing at all likely to yield well. One farmer, with a long experience of wheat growing, reported that he expected 24 bushels per acre, but actually obtained over 40. Fife seems to create the same impression on almost all growers, and the illusion is caused by the fact that it yields a very great number of ears per acre. A bushel of Fife contains 22 per cent. more grains than a bushel of Square Head's Master, and, therefore, if the same quantity of each be sown, the Fife is likely to have a much thicker plant than Square Head's Master. It has also been ascertained by actual counting that Fife tillers exceedingly well, and the number of stems counted in the stubble immediately after harvest were in the proportion of 150 Fife to 100

Square Head's Master. Even then the former did not appear to be before harvest as thick a plant as the latter. From this it will be gathered that the space occupied by an average Fife plant, owing principally to its comparative lack of flag, is quite small, and there seems to be a probability that the yield per acre can be increased by thick seeding without any harm being done to the crop in other ways.

Price Obtained.—Buyers of wheat all over the country seem to have been willing to pay a higher price for Fife than for ordinary English sorts. There may be a difference between the strength of one ordinary sort of English wheat and another when each is tested carefully and fine points are taken into consideration, but for commercial purposes the difference must be readily appreciable if a higher price is to be obtained. The superiority of Fife is so great, and its behaviour in the mill and bakehouse is so strikingly different to that of ordinary English sorts that growers appear to have found no difficulty in obtaining increased prices for it. One prominent miller offered to take all he could get at 2*s.* per quarter more than ordinary English on account of breed only, and expressed his willingness to pay a further increased price for any greater natural weight which Fife might possess on delivery.

Natural Weight.—Almost invariably it possesses a much greater natural weight per bushel than ordinary sorts, and that should be taken into account in making comparisons with other sorts, as to yield of wheat per acre or as to the price obtained. These considerations would account for the fact that several growers report having obtained 3*s.*, 3*s.* 6*d.*, and 4*s.* per quarter more for Fife than for Square Head's Master and similar wheats.

Quality of Straw.—Nearly every grower reports that the straw is of good quality, usually very bright, but inclined to be brittle and weak. Many fear it will go down in a wet season, but the few growers who raised it in 1902 and 1903 did not complain of this, and the fact that it carries so little flag should naturally help it to stand up in stormy weather. The conclusion that the straw is inclined to be weak and brittle cannot, however, be resisted. The defect, such as it is, can be minimized considerably by early cutting and by using the straw in the autumn and winter months, when the

atmosphere is more humid that at other times of the year. One well-known grower reports that by observing these precautions he sold Fife straw on account of its bright clean appearance for 2*s.* per load more than he could obtain for Square Head's Master grown alongside. As a rule Fife straw weighs well in proportion to bulk, probably on account of the absence of flag already referred to.

Quality.—Fife continues to fulfil the highest expectations as to its ability to maintain intact its superb quality. Every report received without exception testifies to its great strength. It should be borne in mind that this sort was tested in the bad harvest of 1902 and in the very wet year but fairly good harvest of 1903, as well as under the favourable climatic conditions of the succeeding harvests; but in each year Fife has maintained its great relative superiority over all sorts of English origin. The samples of it grown in 1906 in all parts of England have varied in quality, but almost invariably within narrow limits. Almost all proved to be as strong as the highest of imported Manitoba wheats when comparative tests have been made simultaneously by the same baker, and the production of this maximum strength has been effected on light as well as heavy soils. Even on two soils described as "light sand," the strength of the flour was very greatly superior to the best of ordinary English wheats. Ordinarily Fife appears to be strong, and is so; but one case was noticed in which Fife, which appeared to be no stronger than ordinary English wheat grown alongside it, was, in fact, when tested twice in the bakehouse, very much superior to the ordinary English. This clearly indicates the power which Fife possesses of extracting something from its natural surroundings which confers on it the inherent quality of strength, and it is thought that Fife is likely to maintain its strength in England indefinitely.

It is mentioned in the Board's leaflet No. 92 on the prevention of bunt and smut that grain is apt to suffer somewhat seriously in germination when treated with blue-stone, and in the *Journal* (August, 1905) a number of experiments are recorded as to the effects of formalin and blue-stone on germination. According to some further experiments (*Agricultural Gazette of New South Wales*, March, 1907) made in New South Wales on the Cowra Experimental Farm, the average of trials with twenty-six varieties showed that treatment with hot water killed 18·6 per cent. of the seed, with blue-stone 18·4 per cent., with formalin 3·7 per cent., with blue-stone and slaked lime 1·8 per cent., and with blue-stone and lime water 1·5 per cent. Although these percentages are not of general application, they may probably be regarded as indicating the relative advantages of the different methods. They suggest very forcibly the desirability of using lime with blue-stone, especially in the case of barley and oats. This may best be done by dusting the seed liberally with air-slaked lime after it has been treated with blue-stone. It should then be spread out to dry.

Prevention of Bunt and Smut.

Experiments in the manuring of seeds hay have been conducted by the Edinburgh and East of Scotland College of Agriculture for the three consecutive seasons 1904–6 at fifty-one centres. The full results are given in Bulletin XIII, from which it appears that the fertilising ingredient that has produced the largest weight of crop has been nitrogen. This has given equally good results either in the form of nitrate of soda or sulphate of ammonia, and the best results from a mixture of the two.

Manuring of Seeds Hay.

The plots receiving the largest amount of nitrogen have given the heaviest crops and valuing their produce at the same rate as that grown on the other plots, they have given the best financial return. Generally, however, it does not seem advisable to apply more than 2 cwts. of nitrate of soda.

Phosphates and potash applied alone, and also in combination with nitrogen, have been remunerative. Their effect in preventing exhaustion of the soil, and in improving the

quality of the hay warrants their inclusion in any artificial dressing for this crop. The mixture which is recommended as most likely to give general satisfaction is $\frac{7}{8}$ cwt. of nitrate of soda, $\frac{5}{8}$ cwt. sulphate of ammonia (both 95 per cent. purity), $2\frac{1}{2}$ cwts. superphosphate (30 per cent. soluble), and $\frac{7}{8}$ cwt. sulphate of potash (55 per cent. purity).

Average Mortality among Horses.

An account of a system of co-operative horse insurance was given in this *Journal* in August last (p. 275), but no reference was made to the average mortality among the horses insured, though it seems to have been very low, only forty-two payments having been made in nine years. The number of horses insured in 1906 was 183.

In France the practice of mutual insurance both for horses and cattle is more common than in this country, and a number of estimates, based on more or less extensive records, are available of the average mortality among horses. Two estimates range from 1·50 to 2·50 per cent., and a calculation of the losses experienced in the French Remount Department in 1905 also comes to 2·50 per cent. A group of societies in Haute-Marne, on the other hand, lost only 1·75 per cent. of the horses insured, while the official Belgian statistics, 1900–1904, show in most cases an average of about 2·30 per cent. These figures are taken from an article in the *Journal d'Agriculture Pratique* (26th September, 1907), and the writer suggests that 2·50 per cent. represents an average mortality among horses one year old and upwards, on which an insurance society may safely reckon. The mortality of animals under one year old is much higher and may reach 10 per cent. and more.

Some similar calculations, based on returns from a number of farms in Germany, appear in the *Mitt. der Deutschen Land. Gesell.* (9th March, 1907), from which it appears that during three years, 1903–05, the average mortality among 11,640 horses was at the rate of 3·4 per cent., and among 2,925 foals at the rate of 6·3 per cent. The bulk of the animals were farm horses. In Denmark returns from 338 societies covering 109,381 horses give a mortality of 3·6 per cent. (Report of International Veterinary Congress, Budapest, 1905, Vol. i, p. 84).

Importation of Horses into Great Britain.

The Board desire to draw attention to the regulation as to the importation of horses, asses and mules contained in the Glanders and Farcy Order of 1907, Section 2 of which provides that no horse, ass or mule brought to Great Britain from any other country, except Ireland the Channel Islands or the Isle of Man, shall be landed in Great Britain unless it is accompanied by a certificate of a veterinary surgeon to the effect that he examined the animal immediately before it was embarked or whilst it was on board the vessel, as the case may be, and that he found that the animal did not show any symptoms of glanders or farcy.

Effect of Pasturage on the Health of Cattle.

The comparative effects of stall-feeding and pasturage from the point of view of physiology and breeding formed the subject of two papers read at the International Veterinary Congress at Vienna, in both of which the importance of feeding in the field was emphasized as a means of maintaining the health and strength of the race. M. de Kovacsy pointed out that an animal kept in the stall is deprived of the hardening influence of nature ; its organism is weakened and loses its capacity to resist disease. It is principally through stall-feeding that tuberculosis is most effectually propagated, for the stalls are mostly dark and badly ventilated, so that disease germs accumulate and are inhaled by healthy animals. In the case of pasturage, infection of this kind occurs far less often, and consequently tuberculosis and other diseases are found in a much slighter proportion among animals kept permanently in the pasture. Stall-feeding on the other hand has the advantage that it enables pasture land to be turned into arable, which is more profitable ; it tends to a richer production of manure ; the manure is more easily managed ; and, finally, the productive capacity of the animals is more easily increased and their produce better turned to account.

The disadvantages of permanent stall-feeding may be lessened by so altering the stalls that light can sufficiently penetrate and exercise its disinfective influence and by making ventilation as perfect as possible ; the floor and the stall-fittings

should all be capable of easy disinfection. In order to strengthen the constitution of young animals they should spend as much time as possible in the open air; in summer they should be kept out all night under a sheltering roof, and even in winter they should be driven out during the warmer hours of the day. After weaning, the young animal should be kept constantly on the pasture, away from the rest of the herd, care being taken to supply a sufficiency of strengthening food, so that it may develop quickly, for only in rare cases does the pasture yield enough nourishment for growing animals. This should be done up to the end of the first year; cattle which have developed well up to that period will afterwards be able to find food enough in the field. The animal reared in the open can then, in case it does not re-act under tuberculin, take up permanent quarters in a light, well-ventilated stall, provided it spends some hours every day in the open. M. de Kovacsy is of opinion that if these rules were strictly observed and carried out the propagation of stable diseases, and especially of tuberculosis, would be checked.

Actinomycosis in Cattle.

The Board recently caused some inquiries to be made with regard to the disease known as Actinomycosis or "Hard-Tongue" of cattle, which has been the cause of much trouble in Norfolk. In this county the opinion appears to be prevalent that it is imported with store cattle from Ireland; but so far as can be gathered from information obtained, through the Board's Correspondents, from a number of farmers whose cattle have suffered from the disease, there seems to be no good reason for believing that Irish cattle more than any other have brought the disease to Norfolk. It is true that the majority of store cattle are Irish or of Irish origin, but since it is well known that Norfolk is badly infested with Actinomycosis it is not surprising that it should be most commonly met with in the kind of cattle which are the most numerous. Scotch, Welsh and English cattle, however, also become affected with the disease when taken to Norfolk.

The number of animals stated to be affected on different farms varies from 2 to 30 per cent. of the cattle kept. The

highest percentage (30) occurred amongst a lot of imported Welsh cattle.

It would seem that the disease is most prevalent from November to June in stores which have been imported into Norfolk in October. Apparently the imported cattle develop the disease in a period of from one to three months after importation into the infected area, and it may be presumed that they contract the disease by being fed on infected forage. No evidence is forthcoming that the disease has ever been established on a hitherto clean farm by the importation of infected animals. On account of the progressive nature of the lesions, however, and of the fact that at certain stages of the life history of the parasite (*Actinomyces*) the disease can be inoculated, it would be unsafe to conclude that a diseased animal does not indirectly help to spread Actinomycosis. It is highly probable, however, that its direct influence in this respect is very small.

It has long been accepted as a fact that the *Actinomyces* is a parasite on certain kinds of forage, especially barley straw. Some of the replies received indicate that the experience of farmers accords with this view, for it is said that the disease is most prevalent in what are termed "mildew years," and on mildew areas, *i.e.*, damp pastures. Some farmers have never seen the disease in locally bred calves, but the experience of others is the reverse. The view that locally-reared cattle resist Actinomycosis is untenable, and any owner having infected animals would be well advised to isolate them.

The disease is frequently successfully combated by administering iodide of potassium under expert supervision as regards the dose and length of time the drug is to be administered. Farmers who have cattle suffering from this disease should consult a veterinary surgeon.

Price of Wool.

The rise which has taken place in the price of British wool since 1902 has probably surpassed in its rapidity and extent any change in agricultural values which has occurred during the whole period since what is usually termed the "depression" set in. It appears that in the short period of three

or four years the value of the year's clip has been enhanced by about 100 per cent. The following table shows the average prices of British wool since 1901, the year when they were at their lowest point :—

Years.	Leicester.*	Half-Breds.*	South-down.*	Lincoln.†	White Cheviot.‡	White Highland.‡
	Per lb. *d.* *d.*	Per lb. *d.* *d.*	Per lb. *d.* *d.*	Per lb. *d.*	Per lb. *d.* *d.*	Per lb. *d.* *d.*
1901	$5\frac{1}{2}$ to 6	$5\frac{1}{2}$ to $9\frac{1}{4}$	$7\frac{1}{4}$ to $9\frac{1}{4}$	$6\frac{7}{8}$	$5\frac{1}{2}$ to $8\frac{1}{4}$	4 to $4\frac{1}{2}$
1902	5 ,, $5\frac{5}{8}$	$5\frac{3}{8}$,, $6\frac{7}{8}$	$7\frac{1}{8}$,, $9\frac{1}{8}$	$6\frac{1}{4}$	$5\frac{3}{4}$,, $8\frac{1}{2}$	$4\frac{1}{4}$,, $4\frac{3}{4}$
1903	$6\frac{1}{2}$,, $6\frac{7}{8}$	$7\frac{1}{8}$,, 8	$8\frac{1}{2}$,, $11\frac{1}{2}$	$7\frac{1}{4}$	$7\frac{1}{2}$,, 9	$5\frac{3}{4}$,, $6\frac{1}{4}$
1904	$8\frac{7}{8}$,, $9\frac{5}{8}$	$9\frac{1}{2}$,, $10\frac{1}{8}$	$9\frac{1}{2}$,, $11\frac{3}{4}$	$10\frac{1}{2}$	10 ,, $10\frac{1}{2}$	7 ,, $7\frac{1}{2}$
1905	$11\frac{3}{8}$,, 12	$11\frac{5}{8}$,, $12\frac{3}{4}$	$11\frac{7}{8}$,, $13\frac{1}{4}$	$12\frac{1}{2}$	12 ,, 13	$7\frac{1}{2}$,, 8
1906	$12\frac{5}{8}$,, 13	$13\frac{3}{8}$,, $14\frac{1}{8}$	$14\frac{1}{8}$,, $15\frac{1}{8}$	$14\frac{1}{8}$	$13\frac{1}{2}$,, $14\frac{1}{4}$	$8\frac{1}{4}$,, $8\frac{3}{4}$

* Computed from the prices given in the *Economist.*
† Extracted from "The *Yorkshire Daily Observer* Wool Tables."
‡ Computed from the prices given in the *Transactions of the Highland and Agricultural Society of Scotland.*

It will be observed that since the rise commenced in 1902 its progress, taking all classes of wool into account, appears to have been fairly consistent from year to year. In 1906 the advance received some check, and for some months there was little if any improvement. On the whole, however, the upward movement continued, and the rise on the year appears to have amounted, on the average, to nearly $1\frac{1}{2}d.$ per lb., while since 1902 it amounts to about $6\frac{1}{2}d.$ per lb., or 100 per cent.

Milk Tests in Wisconsin.

A system of testing the milk yield of pure-bred cows has been in operation in Wisconsin since 1894 in connection with several breeding societies, the tests being carried out by the Wisconsin Experiment Station. The length of the test varies according to the requirements of the societies, and may extend over seven days, generally at the beginning of the lactation period, or over 30 days, or the test may be made one day each month. During late years, however, a strong feeling has grown up among breeders that the only reliable test of the capacity of a cow for dairy production is one continued for an entire lactation period or for a year. Seven-day or thirty-day tests are regarded as interesting as

showing the maximum productive capacity of the cow for a brief period of time; but many farmers look upon them as of little value as evidence of the capacity of the cow for dairy production under ordinary farm conditions. Consequently it was decided in the autumn of 1905 to establish a system of semi-official tests by the Wisconsin Station, open to all dairy farmers and breeders of dairy cattle in the State.

The tests are conducted for two successive days each month throughout the year, the representative of the Station seeing the cow milked dry at the milking directly preceding the test, the last milking of which must come exactly 48 hours after the preliminary milking. He makes a report on the weight and test of each milking for the two days, while the owner himself furnishes certified statements of the daily milk yields for each month during the year. These records are subject to checking and verification in various ways. On completion of 12 monthly tests, records of the production of milk and butter fat by the cows for the entire year are obtained, and certificates of production issued by the Director of the Station. The breeder is thus furnished with an authenticated record of the production of his cows for one year, which may be accepted by buyers of pure-bred cattle and the general public as, at least, approximately correct.

Earnings at Corn Harvest in 1907.

According to the returns furnished to the Board of Trade the earnings of farm labourers during the corn harvest of 1907 were, on the whole, somewhat higher than in 1906. The harvest was more prolonged this year, and owing to the crops being badly laid by rain in a number of districts, self-binding machines could not be so extensively used as in 1906, and consequently there was generally a greater demand for extra men. Except in a very few instances, however, the supply was quite sufficient, and a number of correspondents state that day labourers were more plentiful than a year ago.

The following table shows the average cash earnings, exclusive of the value of any food and drink which may have been provided in addition, of men employed on certain farms in

the eastern, midland, and southern and south-western counties of England respectively for the corn harvest of 1907 :—

District.	Number of Men employed at Harvest on Farms included in Table.	Average duration of Harvest from start to finish (including Sundays).	Average Number of Days on which Harvesting was done.	Average Cash Earnings for Harvest per Man.
		Days.	Days.	£ s. d.
Eastern Counties ...	745	33	26	7 13 5
Midland Counties ...	247	34	27	5 18 7
Southern and South-Western Counties ...	333	32	22	4 18 3

It will be seen that the earnings were highest in the eastern counties, which comprise the great corn-growing counties of Huntingdon, Cambridge, Lincoln, Norfolk, Suffolk, and Essex. The payments in these counties ranged from about £6 10*s.* to £8 10*s.*, though more was earned by some men on piecework in the Fen districts. In parts of Norfolk and in Suffolk and Essex the usual system of payment is for the labourer to contract with the farmer to perform the harvest work for a fixed sum, irrespective of the number of days occupied. A short harvest is thus a profitable one for the labourer, as he gets back to ordinary farm work at weekly wages sooner than in a year when the harvest is lengthened by unfavourable weather.

In the midland and in the southern and south-western counties the systems of payment are frequently on a time-work basis, so that harvest earnings fluctuate from year to year according to the duration of the harvest. The various methods of payment are as follows :—To give the work in separate portions as piecework ; to give the ordinary weekly wages, and, in addition, a bonus of a pound or two at the end of the harvest ; to give extra time wages for a month certain, and then to pay the ordinary weekly wages ; to pay double the ordinary weekly wages during harvest ; to pay a certain rate per day as long as harvest lasts.

The northern counties have been excluded from the above table, as the majority of the farm servants in the north are hired by the year or half-year, and paid a regular wage with

free board and lodging during the whole period for which they are hired, and are given no extra money for harvest, though they are often given extra food and drink. Except in Northumberland and Durham, where the system of engagement closely resembles that in the border counties of Scotland, the married men attached to the staff of a farm generally get from about £4 to £6 for a month at harvest, some food and drink being frequently given in addition. Extra hands, both English and Irish, in these districts sometimes get rather higher payments than the regular men, and often more food. The Irishmen are usually provided with lodging in barns or outhouses.

Utilization of Pond Mud.

Several of the old agricultural writers have advocated the utilization of pond mud, and as a writer in "British Husbandry" (1837) observes: "The mud from ponds, when they are cleaned out has always been an object of attention to farmers." The composition of the sediment may vary considerably, as will be seen from analyses given below, and is naturally dependent on the character of the pond. Where a pond is placed at the lower part of a field it is likely to receive, after rain, surface washings which may be rich in manure. If, however, the pond contains springs, the sediment may be of little or no value.

Pond mud has proved valuable at the Royal Botanic Gardens, Kew, where the deposit from the bottom of the lake has been used for some years past for general gardening purposes, as a dressing for the lawns, and also as a mulch for the beds, borders, and trees. It has also been used for such pot-grown plants as chrysanthemums, dahlias, fuchsias, pelargoniums and other gross feeders. The best examples of *Calanthe* and *Phaius* (orchids) ever grown at Kew were planted in this mud. It is also an excellent soil for vegetables. As an example of how freely it may be used for trees, mention may be made of a mulch, 4 in. thick, which was placed last winter about the large horse-chestnut near the Thames; the effect of this on the health of the tree is already most marked. The only plants for which it has not been found suitable are *Ericaceae* and peat-loving plants generally.

Probably this is due to the presence of calcium carbonate in the Thames water, from which the Kew lake is fed, and also to the shells of various molluscs which are abundant in the lake. The only harm that might possibly result from the use of this mud would arise if it were allowed to lie as a cake, so that air was excluded from the roots. The mud at Kew is the silt from the Thames water and contains decomposed vegetable matter from the surrounding trees, &c.; when first taken out it has almost the consistency of clay, and in this condition is unsuitable for use. The practice at Kew is to drain off the water from the lake, and when the mud can be cut out with spades it is carried in barrows on to the banks where it is allowed to lie and drain until it can be broken up easily. It is then distributed over the lawns, woods, beds, &c., where under the influence of weather it soon breaks down. If used on beds or borders it is forked over, and mixed with the other soil soon after it has been put on. For lawns it is used in the proportion of about twenty loads to the acre, it is then chain harrowed and raked, and after that it soon works down below the grass. When the lake was first cleaned out in 1892 to 1894 the mud was found to be 5 ft. deep in some parts, and altogether some thousands of loads were removed.

An analysis has been made of the mud taken from the Kew lake, and also of some pond mud from Nottinghamshire. The sample from Kew contained 45·15 per cent. of moisture and that from Nottinghamshire contained 78·81 per cent.; in order to enable them to be compared, the results are given in the following table free of moisture :—

—	Sample from Kew.	Sample from Notts.
	Per cent.	Per cent.
Organic matter* and loss on heating ..	11·30	27·71
Oxide of iron and aluminium	8·17	10·45
Lime	12·04	7·79
Magnesia, alkalies, &c.	0·97	7·05
Carbonic acid	8·85	
Phosphoric acid	0·27	0·32
Insoluble siliceous matter	58·40	46·68
Total	100	100
*Containing nitrogen	0·439	0·862
Equal to ammonia	0·533	...

It will be seen that the Kew sample in its dry state had less than half the quantity of vegetable matter (and nitrogen derived therefrom) contained in the other. It had, however, more lime and nearly as much phosphoric acid. The fact that the one sample contained so much less water than the other would make the Kew sample in its natural state the richer of the two. The quantity of lime would make it a useful material for any land where lime is needed.

Two other samples of mud from ponds in Kent are referred to in the fifth report of the Analytical Laboratory at the South-Eastern Agricultural College, Wye. Sample A was from a pond which had not been "mudded" since 1836, and as neither ditches nor drains run into it, the water supply has been kept up only by percolation through the soil which is described as a sandy clay. For many years the pond had, throughout the summer, been a mass of weeds, mainly silk weed and *Nymphea alba*. The analysis showed this mud to contain 23·3 per cent. of water, 7·8 per cent. of organic matter, and ·183 per cent. of nitrogen.

Sample B was from an adjacent pond into which a little ditch and several drains run. It was expected that the mud would be very rich and it was used as a dressing for hops. Analysis showed, however, that mud was little, if any, richer than the soil of the hop garden, and it had not, therefore, much value as a fertiliser. It is mentioned in the report that "The fermentation processes going on at the bottom of a pond are very complete, organic matter is broken up into carbonic acid, marsh gas and hydrogen, and free nitrogen is probably liberated also. Resistant forms of organic matter would survive, but these have little value as manure." The analysis showed this sample to contain 52·2 per cent. of water, 7·3 per cent. of organic matter, and ·175 per cent. of nitrogen.

Generally speaking, the effect of such material is as much a physical or mechanical one as a chemical one, and if used on land of lighter and drier texture would help in improving it. On heavy land, on the other hand, it might not be so successful. It should do very well as a top-dressing for grass.

Dew-Ponds.

The "dew-pond," of which some ancient examples still exist, is a pond constructed in such a way that it obtains water by condensation from the atmosphere and is altogether independent of springs or rainfall. Attention was called to this method of obtaining water in dry situations by Messrs. A. J. and G. Hubbard in their book "Neolithic Dew-ponds and Cattle-ways," and a description of the method of construction was given in this *Journal*, June, 1906, p. 181. In a second edition of their book Messrs. Hubbard give an account of some experiments they have conducted in this connection and point out that some scientific modification of this device might be the means of making habitable large tracts of country which are now desolate owing to the absence of water supplies.

The method of making a dew-pond as still practised in some parts of England is to hollow out a space in excess of the requirements of the proposed pond and then thickly cover the whole of the hollow with a coating of dry straw. The straw in its turn is covered by a layer of well-chosen, finely-puddled clay, and the upper surface of the clay is then closely strewn with stones. Care has to be taken that the margin of the straw is effectively protected by clay. The pond will gradually become filled with water the more rapidly the larger it is, even though no rain may fall.

The explanation given by Messrs. Hubbard of this fact is that if such a structure is situated on the summit of a down, the earth during the warmth of a summer day will have stored a considerable amount of heat, while the pond protected from this heat by the non-conductivity of the straw, is at the same time chilled by the process of evaporation from the puddled clay. The consequence is that during the night the moisture of the comparatively warm air is condensed on the surface of the cold clay. As the condensation during the night is in excess of the evaporation during the day, the pond becomes, night by night, gradually filled.

The general interest that was shown in the above theory induced Messrs. Hubbard to attempt the construction of a large dew-pond on scientific principles. Land could not be obtained at an elevation and the experiment was made on a low-lying site. A space 100 feet square was excavated to a

uniform depth of 1 ft. 6 in. and a layer of concrete was laid over the whole. Upon this a coating of pitch was put to stop any moisture from below from penetrating through the concrete to the layer of non-conducting material. In order to form a suitable bed for the non-conductor, dry sand was spread over the tarred surface. For the non-conducting material, mica as used for boiler-covering was selected. This was specially manufactured in blocks resembling paving stones, 2 ft. square and 2 in. thick. It was intended that the surface of these should be covered with a thin impermeable white enamel, but this was found impossible, so a coating of asphalt was laid over the whole upper surface as well as between the edges. This was not satisfactory and militated against the scientific accuracy of the experiment. However, the pond was tested during 1906, and it was found that water accumulated in it during the night but evaporated during the day. This was probably due to the asphalt, the heat of which when warmed by the sun could not, owing to the non-conducting property of the mica, be transmitted to the earth. In the spring of 1907, however, if was found that the pond remained practically full, and the rain which fell into it during the winter showed no signs of disappearing. Unfortunately the matter could not be conclusively proved as the surface of the asphalt was pierced during the summer and the water admitted to the layer of mica, thus reducing it to a useless pulp.

An interesting point which was tested in the course of these experiments was the effect of colour on the deposition of dew. It was found that a pan painted white collected five times as much dew as one painted black, green being nearly as good.

Notes on the Weather in October.

The short spell of fine weather which was experienced in September gave way in the *first* week of October. Rain occurred rather frequently, and in some places the falls were at times large. The temperature was, however, as a rule high, and was "unusual" in every district. Sunshine was "moderate" except in England S. and S.W., where it was "scanty." A few night frosts were recorded. The *second* week witnessed a change for the worse. Rainfall was "heavy" everywhere ("very heavy" in Scotland E.), the excess above the average being large. Bright sunshine was less prevalent in the west than in the north and east, and as a rule was only "moderate." The warmth, however, was "unusual" in England N.E., E. and S. Thunder and lightning occurred in nearly all parts of the kingdom, and in some places hail was experienced. Ground frost was recorded over a very large area. A gale occurred in the south of England. The *third* week was again wet and unsettled, especially over England and the southern half of Scotland. Thunderstorms

occurred in many parts of the kingdom. The rainfall was "heavy" in England E., S.W. and N.W., "very heavy" in other parts of Great Britain. Several parts of the country recorded falls of much more than an inch in 24 hours, and in some places more than 2 inches. At a place $1\frac{1}{2}$ miles from the centre of Lincoln 3·50 inches fell on the Wednesday alone. No less than 4·92 inches fell in Bournemouth during the week and 4·62 inches at Portland Bill. Bright sunshine was of course deficient, being "moderate" everywhere except in England E. and S., where it was "scanty." Warmth was, however, "unusual" in England N.E., E., and S., elsewhere "moderate." Frost was recorded by the screened thermometer in all districts except England N.E. and S. In the *fourth* week the weather was again generally unsettled and rain frequent, but in most parts of England considerable intervals of sunshine occurred, and in England S. and E., as well as in Scotland N., the rain was unusually light (England E. "very light"). Sunshine was "scanty" in Scotland W. and N. ("very scanty" in Scotland E.), "abundant" in England S. and S.W., elsewhere "moderate." Frosts on the grass were recorded over a large part of the kingdom, but otherwise the temperature was above the mean. Up to the present the Autumn of 1907 has been characterized by unusual warmth. In the eight weeks from 1st September England E. has experienced six weeks of "unusual" and none of "deficient" warmth; England N.E. has also enjoyed six weeks of "unusual" warmth, as many as were recorded in the whole thirteen weeks of the Autumn of 1906, and only one week of "deficient." In both districts, however, four weeks of "heavy" rainfall against only two of "light" have occurred.

The communications received from the Board's correspondents show that some trouble has been experienced from the rain. One says: "The heavy rains of the last few days of October resulted in the flooding of various districts. Near Hereford streams rapidly overflowed their banks, with the result that on Thursday the 31st, many fields were under water, and some of the main roads between Hereford and surrounding villages were impassable except for carts, in some cases for several hundred yards. Even on the roads the water was often a foot deep, while the position of the fields was just marked out by the tops of the hedges. In several instances cattle &c. were only rescued with difficulty. A similar state of affairs was found in Worcestershire and Gloucestershire, and even on the 30th the road at Honeybourne from village to station was under water." A correspondent from the New Forest reports that 9·35 inches of rain fell in that neighbourhood in October. Near Newbury "the month was very wet and the rainfall was much more than the average. The temperature was about normal and there have only been one or two slight frosts. Roots have continued to grow and are wonderfully good, and so are the pastures. The continual rains have made the land very wet and have hindered the work, but taking all things into consideration the country looks wonderfully well." Another correspondent from the same district noted that at the beginning of the month rain was needed, and that even at the end the ground readily absorbed what fell. The final dish of peas was secured on the 9th, fine late strawberries on the 21st. Dahlias were reported as in flower at the end of the month, both at Newbury and in Kent. From Argyll it is reported that "all the corn in the district is cut. Some have all in and thatched, but most have some fields out yet, even in fine days there being no drouth in the air. Some hay still out in small coils, and some even yet to cut. Swedes are a fair crop, yellow turnips not quite so good. Potatoes lifting well for quality, but not a heavy crop."

Notes on Crop Prospects Abroad.

The World's Wheat Crop.—The estimate of the world's wheat crop, which appeared in *Beerbohm's Evening Corn Trade List* in July (see *Journal*, August, 1907. p. 310) has been revised in accordance with later official estimates from Russia, Roumania, France, and the United States, and was (18th October, 1907) put at 383,850,000 qrs. compared with 441,580,000 qrs. last year.

France.—The Report of the Minister of Agriculture on the approximate yield of the barley and oats crops, which appeared in the *Journal Officiel*, 16th October, 1907, gives the area of barley sown in the present year as 1,774,000 acres against 1,752,000 acres in 1906, and the yield as 5,463,000 qrs. against 4,426,000 qrs. The area sown with oats is 9,542,000 acres, as compared with 9,522,000 acres last year, and the yield 38,050,000 qrs. as against 31,125,000 qrs.

Russia.—According to an extract from the *Commercial and Industrial Gazette of St. Petersburg* forwarded to the Foreign Office by Mr. Ernest Scott (12th October, 1907), the winter wheat crops of 1907 in the seventy-two governments of Russia amounted to 3,825,000 tons compared with 6,391,000 tons in 1906. The spring wheat crop is estimated at 8,885,000 tons against 7,392,000 tons in 1906. The total produce is 12,710,000 tons in 1907, compared with 15,745,000 tons during the preceding five years.

Roumania.—The British Consul at Bucharest has forwarded the following official statistics of the harvests of Roumania in 1907 :—

—	Area.		Production.	
	1907.	1906.	1907.	1906.
	Acres.	Acres.	Quarters.	Quarters.
Wheat	4,234,363	4,996,422	5,116,480	13,793,487
Rye	362,247	454,304	309,357	1,087,666
Barley	1,258,941	1,379,989	2,430,264	4,062,827
Oats	870,596	943,328	2,161,271	3,169,542

The yield of wheat is little more than half the average of the preceding five years, while that of rye is only about one-third of the average. Barley and oats are each about 20 per cent. below the five year average.

Argentina.—According to *Dornbusch* (25th October, 1907), the Minister of Agriculture has issued his preliminary estimate of the new crops (1907–8), as compared with last year (1906–7): wheat area, 14,291,000 acres against 14,059,000 acres; yield 4,920,000 tons against 4,245,000 tons. Oats area, 553,000 acres against 395,000 acres; yield 460,000 tons.

United States.—The Crop Reporting Board of the United States Department of Agriculture, stated that the condition of the maize crop on 1st October was 78·0 as compared with 90·1 on the same date in 1906. The preliminary estimate of the yield per acre of spring wheat is 13·1 bushels per acre, and the total yield at 216,067,000 bushels. The yield of winter wheat has already been calculated at 409,500,000 bushels, so that the official figure for the total wheat yield of 1907 is 625,567,000 bushels compared with 735,261,000 bushels in 1906. The preliminary returns indicate an oats crop of about 741,521,000 bushels or an average of 23·5 bushels per acre as compared with 31·2 bushels in 1906. The average quality is 77·0. Barley is estimated to yield 23·9 bushels per acre, and amount to 147,192,000 bushels. The production of oats in 1906, was 964,905,000 bushels, and of barley 178,916,000 bushels.

The preliminary returns of the production of maize published on 9th November gave a total yield of 2,553,732,000 bushels, or an average of 26 bushels per acre as compared with an average of 30·2 bushels in 1906. The yield is thus about 400,000,000 bushels less than last year. The general average of quality is 82·8 per cent. as compared with 89·9 per cent. in 1906. The total yield of potatoes is estimated at 292,427,000 bushels against 308,038,000 bushels in 1906.

Miscellaneous Notes.

Agricultural Machinery in Italy.—Some remarks on the opening for British agricultural machinery in Italy, from the report of Mr. E. H. Godfrey, juror for the agricultural machinery section of the International Exhibition at Milan, are quoted in the *Board of Trade Journal*, 18th July, 1907. In regard to heavy articles such as steam engines and threshing machines, Mr. Godfrey observes that solidity and durability are essential. In these cases the question of draught is not so important because the engine is available for transportation. The heavy hay crops of Italy necessitate a substantial build in hay-making machinery and rakes; here the desideratum is strength and durability combined. On the other hand, in descriptions of implements such as ploughs, drills and harvesters, lightness of draught and cheapness of cost are all important. It is also important that agricultural machinery should be exported in large quantities at a time. If truck loads are sent not so much packing is necessary, and it should be remembered that freight and duty have to be paid on the packing as well as on the machines. Possibly more co-operation between British exporters might lead to economy in forwarding goods to the same country. Mr. Godfrey also makes a number of recommendations as to the class of ploughs and harvesters which are most suitable.

Agricultural Machinery in Turkey.—According to the "Frankfurter Zeitung" of 18th September, a project is now before the Government in Constantinople for the establishment of depôts for agricultural implements and machines, which are to be bought abroad, at the estimated cost of 100,000 francs, but with the stipulation that payment shall stand over for a considerable period, possibly three years, so that the conditions under which these implements and machines are presented to the agriculturists may be as favourable as possible. (*Board of Trade Journal*, 26th September, 1907.)

Agricultural Machinery Bureau at St. Petersburg.—Referring to the recent opening of a bureau under the Board of Agriculture in St. Petersburg, for studying the improvement of agrarian machinery, the "Commercial and Industrial Gazette" (St. Petersburg) states that the number of houses interested in this branch of trade is considerable, but no office existed hitherto which could give attention to spreading the use of improved machinery among the people. The new bureau is managed by Russian agricultural experts in connexion with the Agricultural Museum and various testing stations. This bureau is in touch also with other institutions of a like nature abroad, and it is ready to receive every kind of information about agricultural machinery, including catalogues and price lists. (*Board of Trade Journal*, 3rd October, 1907.)

Demand for Apples in Norway.—The British Vice-Consul at Bergen (Mr. E. F. Gray) has forwarded a list of some of the fruit dealers at Bergen, which may be of interest to British fruit exporters in view of the scarcity of apples that is reported to exist this year on the west coast of Norway. The list may be seen by British fruit exporters at the Commercial Intelligence Branch of the Board of Trade, 73, Basinghall Street, E.C. (*Board of Trade Journal*, 12th September, 1907.)

Legislation as to Plant Diseases in the Colonies.—The regulations controlling the introduction of fruit, plants, &c., into the State of the Commonwealth of Australia, New Zealand and South Africa are given in the Agricultural Gazette of New South Wales, 2nd July, 1907, which is filed in the Library of the Board.

Fertilisers and Feeding Stuffs (General) Regulations, 1907.—The regulations of which notice was given in this *Journal* (September, 1907, p. 371) were signed and sealed on the 18th September last, and will come into force on the 1st January, 1908.

Rabies in Massachusetts.—Rabies was very prevalent in the State of Massachusetts in 1906, 327 cases in dogs being confirmed in the eleven months ending 30th November, in addition to 38 cattle and 6 horses. Dogs which have been exposed to bites of rabid dogs are quarantined for 90 days, but it is found that this period is insufficient. Three cases have occurred during the past year where dogs have gone from four to five months before showing symptoms; all of them were in

quarantine for 90 days from the time of being bitten, and then released as safe, to develop symptoms later, and in one case to do a great deal of mischief before being killed. One horse, bitten on 11th December, developed symptoms of rabies, and was killed on 5th March; while in a dog bitten at the same time, the symptoms did not appear until 21st April, four months and ten days after the animal was bitten. The Chief of the Cattle Bureau observes that where a dog is bitten by another dog known to have rabies, it is erring on the side of safety to have it immediately killed, and this is the wisest course to pursue to protect the health of the community. (*Report of the Cattle Bureau, Massachusetts*, 8th January, 1907.)

Home Office Order as to Persons engaged in Fruit Preserving.—The provisions of the Factory and Workshop Act, 1901, as to period of employment, times for meals, and holidays do not apply to young persons and women engaged in the process of cleaning and preparing fruit so far as is necessary to prevent the spoiling of the fruit immediately on its arrival at a factory or workshop during the months of June, July, August and September; but this exception is subject to such conditions as the Home Secretary may by special Order prescribe. In pursuance of these powers a new Order (Statutory Rules and Orders, 1907. No. 728), dated 11th September, 1907, has been issued repealing an earlier Order dated 17th June, 1902. This Order reproduces, with some amendments, the provisions of the repealed Order, and adds fresh provisions for the supply of suitable sanitary accommodation for the use of persons employed in cleaning or preparing fruit. The Order also enacts that no woman or young person shall be employed in pursuance of the special exception, unless and until the occupier of the factory or workshop holds a certificate from the Inspector of the district to the effect that provision has been made to his satisfaction for compliance with the requirements of the Order as to sanitary and washing accommodation, ventilation, temperature, and other such matters.

Profit-sharing on a Farm in Germany.—An interesting example of a form of profit-sharing which was in operation for many years on a farm in Germany is given in *Fühlings Land. Zeitung* (1st April, 1907). The farm was valued at £4,000, and the owner deducted in the first place from the net profit 5 per cent. on this sum for interest. The remainder was divided into 100 parts, which were shared in the following proportions:—Owner, 50; bailiff, 20; book-keeper, 10; cowman, woodman and brick-maker, 4 each; head man, 2; and six labourers, 1 part each.

According to the "Abstract of Labour Statistics of the United Kingdom," 1905–6, only one agricultural undertaking in which a profit-sharing scheme had been adopted was known to exist in this country on 30th June, 1906. The number of persons participating was 163.

Use of Town Refuse for improving Poor Land.—Mr. Consul Buchmann, in his Report to the Foreign Office on the Agriculture of Bavaria (Annual Series No. 3723), mentions the use of town refuse from Munich as an artificial manure. The material is sifted at the works by a mechanical system of drums, and most of it is turned to account by chemical works on the spot, metal and glass being sold. The remainder is used to fertilise a tract of moorland on which the works are situated. This now produces an abundant crop of potatoes, rye, oats, beet, cabbage, radishes, cauliflowers and cucumbers. It is noted that the crops on the older fields are of better quality and quantity than those on the newly manured ground.

Sheep-Dipping Materials.—The Board of Trade Correspondent at Bloemfontein (Mr. R. Dumaresq) reports that the Department of Agriculture of the Orange River Colony, after carrying out careful experiments on the merits of the various sheep-dipping materials, proprietary and otherwise, now before the public, has decided in future to recommend strongly the use of a mixture made up in the following proportions:—5 lb. caustic soda 99 per cent., 20 lb. flowers of sulphur (Brandrams or equally good), and 100 gallons of water. There would appear, he says, to be a likelihood of a considerable demand for these materials, and manufacturers would do well to communicate with the Secretary, Bloemfontein Chamber of Commerce, direct on the matter. (*Board of Trade Journal*, 26th September, 1907.)

The Weed Persicaria.—The Board have received specimens of *Polygonum Persicaria*, a branched annual weed, which grows erect, and attains a height of six inches up to one-and-a-half feet. The stems are usually swollen at the nodes or joints, and the ovate or lanceolate leaves often bear a black blotch, while the flowers are borne in clusters. This weed favours damp soils, and, while it must be vigorously attacked with the hoe to prevent seeding, draining may frequently prove useful.

American Gooseberry Mildew in Derbyshire and Cambridgeshire.—The Board have made two Orders with a view to the extirpation of gooseberry mildew. One Order applies to the administrative counties of Derby, Leicester and Nottingham, and the county boroughs of Derby, Leicester and Nottingham ; the other Order applies to the administrative counties of Cambridge and Huntingdon, and the borough of Cambridge. Both Orders are similar in form to the Order applying to Warwickshire (See *Journal*, September, 1907, p. 371, and August, 1907, p. 300).

Pure-Bred Stock for Roumania.—The *Curierul Financier* of 30th September (13th October) states that the "Ministère des Domaines" of Roumania intends shortly to send abroad a special commission to purchase pure-bred stock to the amount of 500,000 frs. The prices to be paid are : for bullocks, 600 frs. ; for colts, from 600 to 700 frs. ; for cows, from 700 to 900 frs. ; for he-goats, 100 frs. ; and for she-goats, from 80 to 100 frs. (*Board of Trade Journal*, 24th October, 1907).

Use of Sulphuric Acid as a Fungicide.—A safe and useful fungicide, which is used with satisfactory results at the Royal Gardens, Kew, is a solution of sulphuric acid in the proportion of 1 to 1,000, or 1 lb. to 100 gallons. This does not injure the plant, and completely destroys mildew and similar fungi. No harm will be done to pumps, &c., if a small amount of clear water is pumped through the apparatus at the conclusion of spraying. This should be done, whatever solution is used, as the apparatus is then left in a clean condition.

Produce of Hops.

The Board of Agriculture and Fisheries have issued the following preliminary statement showing the estimated production of hops in the years 1907 and 1906, with the acreage and estimated average yield per statute acre in each county of England in which hops were grown :—

Counties, &c.	Estimated Total Produce.		Acreage Returned on 4th June.		Estimated Average Yield per Acre.	
	1907.	1906.	1907.	1906.	1907.	1906.
	Cwts.	Cwts.	Acres.	Acres.	Cwts.	Cwts.
Kent — East ...	62,035	46,236	8,996	9,863	6·90	4·69
Kent — Mid ...	66,117	50,152	9,647	9,849	6·85	5·09
Kent — Weald ...	93,708	70,243	9,526	9,584	9·84	7·33
Total, Kent	221,860	166,631	28,169	29,296	7·88	5·69
Hants	17,865	10,263	1,842	1,939	9·70	5·29
Hereford	58,268	24,953	6,143	6,481	9·48	3·85
Salop	910	442	129	127	7·05	3·48
Surrey	7,089	3,399	744	777	9·53	4·37
Sussex	39,679	22,070	4,243	4,379	9·35	5·04
Worcester	28,216	17,893	3,622	3,672	7·79	4·87
Other Countries* ...	242	37	46	51	5·25	0·72
Total ...	374,129	245,688	44,938	46,722	8·33	5·26

* Gloucester and Suffolk.

SELECTED CONTENTS OF CURRENT PERIODICALS.

Proceedings of the Association of Economic Biologists. I. 3.
Sea Fisheries, *A. E. Shipley ;* On the American Gooseberry-mildew : an epidemic fungus disease now invading Europe, *E. S. Salmon.*

Science Progress. II. 6.
Bread, *A. E. Humphries ;* Economic Ornithology in relation to Agriculture, Horticulture and Forestry, *F. V. Theobald.*

Bulletin des. Séances de la Société Nationale d'Agriculture, 1907. V.
Les expériences officielles des tirs contre la grêle en Italie, *Dr. Vidal ;* Les warrants agricoles, *René Worms.*

Naturwissenschaftliche Zeitschrift für Land-und Forstwirtschaft. V. 9.
Über die electrische Leitfähigkeit der Bäume, nebst Beiträgen zur Frage nach den Ursachen der Blitzschläge in Baume, *F. Wolff.*

Die landwirtschaftlichen Versuchs-Stationen, LXVII. III u. IV.
Versuche über die Einwirkung von Flugstaub auf Boden und Pflanzen, *Emil Haselhoff ;* Untersuchungen über einige Ernährungsunterschiede der Leguminosen und Gramineen und ihre wahrscheinliche Ursache, *Otto Lemmermann ;* Weitere Untersuchugen über den Einfluss von Reizstoffen auf die Milchsekretion, *G. Fingerling.*

ADDITIONS TO THE LIBRARY.

Austria-Hungary—

Herman, Otto.—The International Convention for the Protection of Birds concluded in 1902 ; and Hungary (241 pp.). Budapest : Royal Hungarian Minister of Agriculture, 1907.

Germany—

Jahresbericht über die Fortschritte auf dem Gesamtgebiete der Agrikultur-Chemie, 1906. (625 pp.) Berlin : Paul Parey, 1907. 26m.

Kirchner, W.—Handbuch der Milchwirtschaft. 5e Auflage. Berlin : Paul Parey, 1907.

Great Britain—

Aves, E.—Co-operative Industry. (310 pp.) London : Methuen, 1907.

Sawer, J. Ch.—Odorographia. 2 vols. (383 + 523 pp.) London : Gurney & Jackson, 1892 and 1894.

Punnett, R. C.—Mendelism. 2nd Edition. (84 pp.) Cambridge : MacMillan & Bowes, 1907. 2s. net.

Percival, J.—Agricultural Botany. 3rd Edition. (806 pp.) London : Duckworth & Co., 1907. 7s. 6d. net.

Memoirs of the Geological Survey.—The Geology of the Land's End District (158 pp. + 6 plates) ; of the Country around Hungerford and Newbury (150 pp.) ; of the Leicestershire and South Derbyshire Coalfield (373 + 4 plates). London : Stanford, 1907. 3s. 6d., 2s. 6d. and 6s. respectively.

Kersey, H. W.—A Simple Method of Book-Keeping for Farmers, Market-Gardeners and Dairymen. (62 pp.) London : Headley, Bros., 1907. 1s. 6d.

Cooke, M. C.—Introduction to the study of Fungi. (360 pp.) London : A. & C. Black, 1895.

Italy—

Ministerio dei Lavori Pubblici.—Seconda Relazione sulle Bonificazioni. (515 pp.) Rome, 1907.

United States—

Shaw, T.—Feeding Farm Animals. (536 pp.) New York: Orange Judd Company, 1907.

Smith, Erwin F.—Bacteria in Relation to Plant Diseases. Vol. i.: Methods of work and general literature of bacteriology, exclusive of plant diseases. (285 pp.) Washington: Carnegie Institution, 1905.

Department of Agriculture, Bureau of Chemistry:—

Circ. 36.—Chemical Methods for utilising wood. (47 pp.) Bull. 106.—Cassava. (30 pp.) Washington, 1907.

Bureau of Entomology:—

Bull. 66.—Part III: The Cranberry Spanworm; The Striped Garden Caterpillar. (32 pp.) Washington, 1907.

Office of Experiment Stations:—

Bull 188.—Irrigation in the Yakima Valley, Washington. (89 pp.) Bull. 190.—Irrigation in Northern Italy. Part II. (86 pp.) Washington, 1907.

Farmers' Bulletins:—

No. 298.—Food Value of Corn and Corn Products. (40 pp.) No. 302.—Sea Island Cotton. (48 pp.) No. 303.—Corn Harvesting Machinery. (32 pp.) No. 305.—Experiment Station Work. XLII. (32 pp.) No. 308.—Game Laws for 1907. (52 pp.) Washington, 1907.

Forest Service:—

Circ. 102.—Production of Red Cedar for Pencil Wood. (19 pp.) Circ. 107.—Sawmills Statistics. (2 pp.)

Bureau of Plant Industry:—

Bull. 102.—Part VI. The History of the Cowpea and Its Introduction into America. (21 pp.) Part VII. A New Method for the Determination of Nicotine in Tobacco. (13 pp.) Bull 111.—Part I. The Larkspurs as poisonous Plants. (12 pp.) Part II. The Fibres of Long-Staple Upland Cottons. (7 pp.) Washington, 1907.

Bureau of Soils.—Bull. 45. The Moisture Equivalents of Soils. (23 pp.) Washington, 1907.

Connecticut Agricultural Experiment Station.—Report, 1906. (423 pp.) 1907.

Hawaii Agricultural Experiment Station:—

Report for 1906. (88 pp.) Bull 1.—Chickens and Their Diseases in Hawaii. (23 pp.) Bull. 3.—Insecticides for Use in Hawaii. (21 pp.) Bull. 8.—Methods of Milking. (15 pp.) Bull. 9.—Citrus Fruits in Hawaii. (31 pp.) Bull. 10.—Insect Enemies of Tobacco in Hawaii. (16 pp.) Bull. 11.—The Black Wattle in Hawaii. (16 pp.) Bull. 12.—The Mango in Hawaii. (32 pp.) Bull. 13.—The Composition of Some Hawaiian Feeding Stuffs. (23 pp.) Washington, 1901–1907.

Bull. 2.—The Root Rot of Taro. (21 pp.) Bull. 5.—A Sugar Cane Leaf-Hopper in Hawaii. (29 pp.) Bull. 6.—Mosquitoes in Hawaii. (30 pp.) Bull. 7.—The Banana in Hawaii. (53 pp.) Bull. 14.—Marketing Hawaiian Fruits. (44 pp.) Honolulu.

Indiana Horticultural Society.—Report of Proceedings. 1906. (303 pp.)

Iowa Experiment Station:—

Bull. 91.—Experiments in Swine Feeding. (61 pp.) Bull. 92.—Tuberculosis in Swine. (23 pp.) Ames, 1907.

Virginia Agricultural Experiment Station:—

Bull. 164.—Stall Feeding *versus* Grazing. (50–88 pp.) Bull. 165.—The Improvement of Corn. (89–185 pp.) Blacksburg, 1907.

Wisconsin Agricultural Experiment Station:—

Bull. 151.—Condimental Stock Foods. (40 pp.) Bull. 152.—A Comparison of Aniline and Anatto Butter Colours in Butter Making. (19 pp.) Madison, 1907.

[Books may be borrowed from the Board's Library on certain conditions, which may be ascertained on application.]

PRICES OF AGRICULTURAL PRODUCE.

AVERAGE PRICES of LIVE STOCK in ENGLAND and SCOTLAND in the Month of October, 1907.

(*Compiled from Reports received from the Board's Market Reporters.*)

Description.	England. First Quality.	England. Second Quality.	Scotland. First Quality.	Scotland. Second Quality.
FAT STOCK :—	per stone.*	per stone.*	per cwt.†	per cwt.†
Cattle :—	*s. d.*	*s. d.*	*s. d.*	*s. d.*
Polled Scots	7 7	7 3	37 8	33 10
Herefords	7 8	7 2	—	—
Shorthorns	7 6	6 11	36 5	33 0
Devons	7 11	7 3	—	—
	per lb.*	per lb.*	per lb.*	per lb.*
	d.	*d.*	*d.*	*d.*
Veal Calves	7½	6¾	8	6¼
Sheep :—				
Downs	9	8¼	—	—
Longwools	8¼	7½	—	—
Cheviots	9	8½	8¾	7¾
Blackfaced	8¼	7½	8¼	7¼
Cross-breds	8¾	8	9	7¾
	per stone.*	per stone.*	per stone.*	per stone.*
Pigs :—	*s. d.*	*s. d.*	*s. d.*	*s. d.*
Bacon Pigs	6 6	6 0	6 0	5 4
Porkers	7 0	6 6	6 6	5 10
LEAN STOCK :—	per head.	per head.	per head.	per head.
Milking Cows :—	£ *s.*	£ *s.*	£ *s.*	£ *s.*
Shorthorns—In Milk	21 12	18 3	22 6	18 3
,, —Calvers	20 13	17 14	19 8	17 3
Other Breeds—In Milk ..	18 8	13 18	19 14	16 1
,, —Calvers ...	14 5	13 5	19 5	15 17
Calves for Rearing	2 1	1 12	2 1	1 9
Store Cattle :—				
Shorthorns—Yearlings ...	10 0	8 6	9 17	8 3
,, —Two-year-olds ...	14 6	12 10	13 18	11 14
,, —Three-year-olds	16 15	15 5	16 0	14 0
Polled Scots—Two-year-olds	—	—	14 9	12 15
Herefords— ,,	15 8	13 8	—	—
Devons— ,,	13 2	11 8	—	—
Store Sheep :—	*s. d.*	*s. d.*	*s. d.*	*s. d.*
Hoggs, Hoggets, Tegs, and Lambs—				
Downs or Longwools ...	41 5	35 9	—	—
Scotch Cross-breds	—	—	28 3	24 0
Store Pigs :—				
Under 4 months	24 10	17 7	19 10	15 5

* Estimated carcase weight.

† Live weight

AVERAGE PRICES of DEAD MEAT at certain MARKETS in ENGLAND and SCOTLAND in the Month of October, 1907.

(Compiled from Reports received from the Board's Market Reporters.)

Description.	Quality.	London.		Birmingham.		Manchester.		Liverpool.		Glasgow.		Edinburgh.	
		per cwt.		per cwt.		per cwt.		per cwt.		per cwt.		per cwt.	
		s.	d.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.
BEEF :—													
English	1st	51	0	48	6	46	0	46	6	55	0*	51	6*
	2nd	48	6	43	6	42	6	43	0	51	6*	44	6*
Cow and Bull ...	1st	32	6	42	0	41	6	38	6	43	6	40	0
	2nd	18	6	37	6	36	0	33	6	36	6	36	0
U.S.A. and Canadian :—													
Port Killed ...	1st	51	6	47	6	—		48	6	49	6	—	
	2nd	48	6	42	0	44	0	44	0	47	0	45	6
Argentine Frozen—													
Hind Quarters ...	1st	34	0	34	0	33	0	33	0	37	0	36	0
Fore ,, ...	1st	23	0	24	6	23	6	23	6	25	6	26	6
Argentine Chilled—													
Hind Quarters ...	1st	45	0	44	0	41	0	39	0	44	6	44	4
Fore ,, ...	1st	27	0	29	0	28	0	29	6	28	0	27	0
American Chilled—													
Hind Quarters ...	1st	60	0	56	6	56	0	56	0	58	6	57	6
Fore ,, ...	1st	36	0	35	6	35	0	33	6	37	0	37	0
VEAL :—													
British	1st	62	0	57	6	60	6	67	0	—		—	
	2nd	58	0	47	0	56	0	62	6	—		—	
Foreign	1st	66	0	—		—		—		—		59	6
MUTTON :—													
Scotch	1st	71	6	69	0	69	6	72	0	69	6	65	0
	2nd	65	6	51	6	65	6	66	0	52	0	54	0
English	1st	67	0	69	6	66	6	66	0	—		—	
	2nd	59	0	51	6	62	6	60	6	—		—	
U.S.A. and Canadian—													
Port killed ...	1st	—		—		—		—		—		—	
Argentine Frozen ...	1st	31	0	31	6	31	0	31	0	30	0	30	6
Australian ,, ...	1st	28	6	30	0	30	0	30	0	30	0	—	
New Zealand ,, ...	1st	38	6	37	6	—		42	0	—		—	
LAMB :—													
British	1st	74	6	68	0	67	0	70	0	72	0	66	6
	2nd	70	0	63	6	62	6	64	6	58	6	56	0
New Zealand ..	1st	50	6	52	6	51	6	51	6	46	6	51	0
Australian	1st	50	0	46	6	45	0	46	0	44	6	—	
Argentine	1st	—		46	6	—		—		—		—	
PORK :—													
British	1st	59	6	64	6	66	0	64	6	53	6	51	6
	2nd	52	6	56	6	60	6	60	0	52	0	43	6
Foreign	1st	56	6	65	6	64	6	64	6	49	0	—	

* Scotch.

AVERAGE PRICES of **British Corn** per Quarter of 8 Imperial Bushels, computed from the Returns received under the Corn Returns Act, 1882, in each Week in 1905, 1906 and 1907.

Weeks ended (*in* 1907).	Wheat.						Barley.						Oats.					
	1905.		1906.		1907.		1905.		1906.		1907.		1905.		1906.		1907.	
	s.	*d.*	*s.*	*d.*	*s.*	*d.*	*s.*	*d.*	*s.*	*d.*	*s.*	*d.*	*s.*	*d.*	*s.*	*d.*	*s.*	*d.*
Jan. 5 ...	30	4	28	4	26	0	24	4	24	6	23	11	16	3	18	2	17	3
,, 12 ...	30	4	28	6	26	1	24	6	24	8	24	2	16	3	18	4	17	4
,, 19 ...	30	5	28	5	26	1	25	0	24	11	24	1	16	5	18	4	17	5
,, 26 ...	30	6	28	7	26	2	25	1	25	1	24	5	16	7	18	7	17	5
Feb. 2 ...	30	6	28	10	26	3	25	0	25	1	24	4	16	7	18	10	17	5
,, 9 ...	30	7	28	10	26	6	25	2	25	3	24	5	16	8	18	10	17	7
,, 16 ...	30	5	28	11	26	7	25	2	25	6	24	1	16	9	19	0	17	7
,, 23 ...	30	10	28	10	26	10	25	0	25	4	24	2	16	10	19	0	17	9
Mar. 2 ...	30	8	28	8	26	9	25	2	25	0	24	2	16	10	19	0	17	9
,, 9 ...	30	9	28	5	26	8	25	2	25	1	23	11	16	10	18	8	17	11
,, 16 ...	30	10	28	5	26	10	24	11	24	8	24	2	16	10	18	10	18	0
,, 23 ...	30	9	28	4	26	10	25	2	24	4	24	0	17	0	18	8	18	1
,, 30 ...	30	9	28	3	26	8	25	1	24	5	23	9	16	11	18	11	18	2
Apl. 6 ...	30	9	28	7	26	9	25	6	24	2	24	3	17	0	18	11	18	3
,, 13 ...	30	8	28	11	26	8	24	3	24	4	23	9	17	6	19	4	18	6
,, 20 ...	30	8	29	4	26	8	24	4	24	0	23	3	17	5	19	1	18	7
,, 27 ..	30	9	29	6	26	10	24	4	24	0	23	3	17	9	19	6	18	9
May 4 ...	30	8	29	10	27	0	25	3	23	10	23	6	18	0	19	9	19	3
,, 11 ...	30	8	30	1	27	6	24	10	24	1	24	0	18	3	20	0	19	7
,, 18 ...	30	10	30	3	28	4	24	8	23	10	23	10	18	5	20	1	20	1
,, 25 ...	30	11	30	4	29	7	24	4	24	2	24	3	18	8	20	2	20	5
June 1 ...	31	3	30	4	31	4	23	6	22	10	24	0	19	1	20	5	20	8
,, 8 ...	31	4	30	3	32	0	24	0	23	4	24	7	18	11	19	11	20	7
,, 15 ...	31	7	30	4	31	10	26	0	23	6	24	7	19	1	20	2	20	11
,, 22 ...	31	7	30	5	31	4	23	9	22	10	24	11	18	10	20	2	20	9
,, 29 ...	31	8	30	3	31	2	23	2	24	3	24	6	19	7	20	1	20	8
July 6 ...	32	1	30	2	31	3	22	11	23	0	24	8	19	6	20	2	20	11
,, 13 ...	32	3	30	5	32	0	23	10	23	8	24	10	19	7	20	4	20	11
,, 20 ...	32	2	30	3	32	6	23	7	23	2	24	6	18	11	20	5	21	1
,, 27 ...	32	3	30	5	32	11	23	11	22	4	27	3	19	3	20	2	20	8
Aug. 3 ...	31	11	30	9	33	2	22	0	22	1	26	4	18	4	19	3	21	2
,, 10 ...	30	5	30	5	33	5	22	5	23	0	26	6	16	11	17	11	21	3
,, 17 ...	28	5	29	0	33	6	23	4	24	2	25	9	16	4	17	0	20	4
,, 24 ...	27	1	27	9	33	7	23	6	25	0	25	0	15	9	16	10	19	8
,, 31 ...	26	11	26	9	33	10	23	5	24	3	24	6	15	9	16	6	18	11
Sept. 7 ...	27	1	26	4	31	11	23	4	24	9	24	2	15	11	16	3	17	7
,, 14 ...	26	11	25	11	31	4	23	7	24	3	24	4	16	0	16	1	17	6
,, 21 ...	26	8	25	9	31	5	23	10	24	3	25	0	15	11	16	0	17	6
,, 28 ...	26	9	25	9	31	8	24	3	24	8	25	3	16	1	16	2	17	8
Oct. 5 ...	26	9	26	1	32	6	24	9	25	0	25	5	16	3	16	3	17	9
,, 12 ...	26	11	26	3	33	3	24	10	25	3	25	9	16	6	16	7	17	11
,, 19 ...	27	1	26	6	34	4	25	0	24	10	26	3	16	7	16	8	18	0
,, 26 ...	27	4	26	7	35	9	24	11	24	10	27	2	16	8	16	10	18	7
Nov. 2 ...	27	10	26	7	36	3	24	9	24	8	27	7	17	1	16	11	18	10
,, 9 ...	28	3	26	6	35	10	24	10	24	8	27	8	17	4	17	1	18	10
,, 16 ...	28	7	26	4			24	6	24	4			17	8	17	2		
,, 23 ...	28	5	26	3			24	6	24	1			17	9	17	3		
,, 30 ...	28	8	26	1			24	6	24	1			17	11	17	2		
Dec. 7 ...	28	6	26	1			24	7	24	1			17	11	17	4		
,, 14 ...	28	5	26	1			24	5	23	11			17	11	17	3		
,, 21 ...	28	4	26	3			24	6	24	3			17	11	17	3		
,, 28 ...	28	3	26	0			24	7	24	1			18	1	17	3		

NOTE.—Returns of purchases by weight or weighed measure are converted to Imperial Bushels at the following rates : Wheat, 60 lbs. ; Barley, 50 lbs. ; Oats, 39 lbs. per Imperial Bushel.

AVERAGE PRICES of **Wheat, Barley,** and **Oats** per Imperial Quarter in FRANCE, BELGIUM, and GERMANY, and at PARIS, BERLIN, and BRESLAU.

—		Wheat.		Barley.		Oats.	
		1906.	1907.	1906.	1907.	1906.	1907.
		s. d.	*s. d.*	*s. d.*	*s. d.*	*s. d.*	*s. d.*
France:	September	38 9	39 10	25 0	25 1	22 6	19 10
	October ...	39 2	39 10	25 5	25 7	22 7	19 9
Paris:	September	38 9	40 6	25 5	26 8	22 2	20 5
	October ...	40 8	39 3	26 3	26 3	23 1	19 4
Belgium:	July ...	29 8	35 4	23 11	25 5	22 7	24 0
	August ...	29 5	35 2	22 10	25 0	20 10	23 3
Germany:	September	37 9	47 10	28 3	30 6	21 0	24 1
	October ...	38 11	49 8	30 5	32 11	22 4	24 10
Berlin:	August ...	38 0	46 6	—	—	21 7	27 2
	September	38 2	49 0	—	—	21 5	25 2
Breslau:	August ...	37 2	45 5	27 4 (brewing) 23 3 (other)	29 5 (brewing) 27 0 (other)	24 1	25 0
	September	36 10	47 5	28 8 (brewing) 23 3 (other)	30 1 (brewing) 27 0 (other)	24 1	25 0

NOTE.—The prices of grain in France have been compiled from the official weekly averages published in the *Journal d'Agriculture Pratique*; the Belgian quotations are the official monthly averages published in the *Moniteur Belge*; the German quotations are taken from the *Deutscher Reichsanzeiger*, the prices for the German Empire representing the average of the prices at a number of markets.

AVERAGE PRICES of **British Wheat, Barley,** and **Oats** at certain Markets during the Month of October, 1906 and 1907.

—	Wheat.		Barley.		Oats.	
	1906.	1907.	1906.	1907.	1906.	1907.
	s. d.	*s. d.*	*s. d.*	*s. d.*	*s. d.*	*s. d.*
London...	27 8	35 5	26 3	27 1	17 6	19 4
Norwich	26 6	33 3	25 1	25 11	16 4	17 9
Peterborough	25 8	34 2	24 5	25 10	16 0	17 8
Lincoln...	25 10	34 8	24 11	26 1	16 2	17 11
Doncaster	25 8	33 10	23 9	25 2	16 2	18 2
Salisbury	26 11	33 9	24 10	26 11	17 0	17 8

AVERAGE PRICES of PROVISIONS, POTATOES, and HAY at certain MARKETS in ENGLAND and SCOTLAND in the Month of October, 1907.

(Compiled from Reports received from the Board's Market Reporters.)

Description.	London.		Bristol.		Liverpool.		Glasgow.	
	First Quality.	Second Quality.	First Quality.	Second Quality.	First Quality.	Second Quality.	First Quality.	Second Quality.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
BUTTER :—	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.
British ...	14 6	13 6	14 0	12 9	—	—	14 9	—
	per cwt.	per cwt.	per cwt.	per cwt.	per cwt.	per cwt.	per cwt.	per cwt.
Irish Creamery	116 6	113 0	117 0	113 6	118 0	116 0	119 0	—
,, Factory	97 0	88 6	96 0	90 0	103 0	93 0	—	—
Danish ...	122 0	109 6	—	—	124 6	122 0	123 6	—
Russian ...	105 0	100 0	103 6	93 6	103 6	93 0	106 6	98 6
Australian ...	116 0	113 0	109 6	95 6	—	—	—	—
New Zealand	115 0	111 6	111 6	106 6	—	—	—	—
CHEESE :—								
British—								
Cheddar ...	73 0	70 0	72 0	61 0	73 0	67 0	66 6	62 0
					120 lb.	120 lb.		
Cheshire ...	—	—	—	—	70 6	65 0	—	—
					per cwt.	per cwt.		
Canadian ...	63 0	62 0	62 6	60 6	62 6	60 0	63 0	61 0
BACON :—								
Irish	64 6	60 0	—	—	63 6	61 0	65 6	63 0
Canadian ...	59 0	57 0	60 6	56 0	59 6	57 6	61 0	58 0
HAMS :—								
Cumberland ...	105 0	97 6	—	—	—	—	—	—
Irish	99 0	91 0	—	—	—	—	96 0	83 0
American (long cut) ...	58 6	56 0	56 6	53 0	56 6	52 6	56 0	54 0
EGGS :—	per 120.	per 120.	per 120.	per 120.	per 120.	per 120.	per 120.	per 120.
British ...	15 7	13 6	14 4	—	—	—	—	—
Irish	13 1	11 6	12 1	11 2	12 0	10 8	11 11	10 5
Danish ...	12 7	11 5	12 4	11 4	12 2	11 5	11 10	10 10
POTATOES :—	per ton.	per ton.	per ton.	per ton.	per ton.	per ton.	per ton.	per ton.
British Queen	85 6	75 6	85 0	78 0	83 6	75 0	87 6	80 0
Langworthy ...	96 0	83 6	100 0	75 0	103 6	98 6	80 6	70 0
Up-to-Date ...	87 0	75 6	91 0	81 0	78 6	70 0	81 0	75 0
HAY :—								
Clover ...	103 6	90 6	88 0	80 0	101 0	70 0	76 0	71 0
Meadow ...	93 0	80 6	81 0	73 0	—	—	74 0	69 0

DISEASES OF ANIMALS ACTS, 1894 to 1903.

NUMBER of OUTBREAKS, and of ANIMALS Attacked or Slaughtered.

GREAT BRITAIN.

(From the Returns of the Board of Agriculture and Fisheries.)

DISEASE.	OCTOBER.		10 MONTHS ENDED OCTOBER.	
	1907.	1906.	1907.	1906.
Swine-Fever :—				
Outbreaks	117	111	2,078	959
Swine Slaughtered as diseased or exposed to infection ...	677	684	9,889	5,493
Anthrax :—				
Outbreaks	73	82	903	753
Animals attacked	130	107	1,219	1,079
Glanders (including Farcy) :—				
Outbreaks	56	92	718	917
Animals attacked	123	192	1,645	1,741
Sheep-Scab :—				
Outbreaks	22	24	443	331

IRELAND.

(From the Returns of the Department of Agriculture and Technical Instruction for Ireland.)

DISEASE.	OCTOBER.		10 MONTHS ENDED OCTOBER.	
	1907.	1906.	1907.	1906.
Swine-Fever :—				
Outbreaks	15	3	135	84
Swine Slaughtered as diseased or exposed to infection ...	297	34	2,375	948
Anthrax :—				
Outbreaks	1	—	3	3
Animals attacked	1	—	5	7
Glanders (including Farcy) :—				
Outbreaks	—	2	5	8
Animals attacked	—	2	9	16
Sheep-Scab :—				
Outbreaks	7	14	206	185

(5,000 11 | 07—H & S 2409)

THE JOURNAL

OF THE

BOARD OF AGRICULTURE.

Vol. XIV. No. 9.

DECEMBER, 1907.

IMPROVED GRAIN-DRYING SHEDS.

GEO. W. CONSTABLE.

In view of the immense loss Scottish farmers have this year sustained owing to the late harvest and the almost unprecedented rainfall in October, it may be opportune to call the attention of proprietors and farmers generally to the many advantages and the certain gain to be derived from having an Improved Grain-Drying Shed.

Wherever these have been erected grain can be carted straight from the binder, and, to a certain extent, what is cut each day can thus be secured by night.

The Improved Grain-Drying Shed is a Richmond Grain-Drying Rack and a shed combined, and is undoubtedly a great improvement on the Rack alone, while the cost is not much greater. Two of these sheds have been erected near Innerleithen and have given the greatest satisfaction. I shall describe one of them put up at Glenormiston, near Innerleithen, by M. G. Thorburn, Esq., the proprietor.

This shed is 144 ft. long and 24 ft. wide, covered with corrugated iron sheets, which project 2 ft. over each side, and is fitted with rhones and conductors.

The straining posts (Fig. 5A) are "H" steel joists, 20 ft. long, 8 in. by 6 in. by 30 lb., with $2\frac{1}{2}$ in. by $2\frac{1}{2}$ in. by $\frac{3}{8}$ in. angles bolted to the sides of the joists (Fig. 6), to which the wires, afterwards described, are attached by galvanised straining eye-bolts, 12 in. by $\frac{1}{2}$ in. The straining posts are sunk 4 ft. in the ground in solid concrete and should rest on a flat stone. In order to prevent them lifting, a $1\frac{1}{2}$-in. hole is bored through

each, about 12 in. from the foot, and an iron rod 1 ft. 9 in. by $1\frac{1}{2}$ in. is put through the hole (Fig. 5, BB).

The four stays or rances are "H" joists, 6 in. by 3 in., and are bolted to the strainers and to the first intermediate post (Fig. 5, CC). It is absolutely necessary that the foundations of the four strainers should be thoroughly secure, as the whole structure when filled with grain presents so great a surface to the wind. Intermediate standards of "H" iron, 6 in. by 3 in., with wood 3 in. by 3 in. bolted on each side (Fig. 4, DD and Fig. 7) are erected 4 yards apart from end to end. These are 20 ft. long, and 4 ft. of each is embedded in concrete, in the same way as the strainers but without the through iron rod.

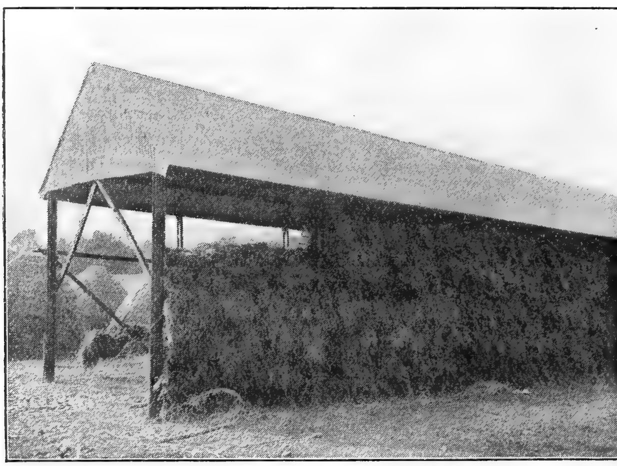


FIG. 1.—North Side of Shed.

On these intermediate standards solid galvanised wires (No. 6) are supported, after being attached to the strainers by the eye-bolts.

Staples are used to support the wires, and should be driven in the wood bolted to the intermediates, at an acute angle and so driven that the wire will rest on both legs of the staple and only sufficient left undriven as will support the wires, besides leaving room for a wire to pass down perpendicularly through the staples to keep the horizontal wires which rest on the staples confined between the wood of the intermediate standards and the perpendicular wire. Staples $2\frac{1}{2}$ in. long, made of No. 4 wire (galvanised) will suit and they should be driven in about $1\frac{1}{2}$ in.

On the inside and also on the outside of the intermediates are wires which must be attached to the strainers, but the outside wires are not so close to each other as the inside wires. The distances between the staples on the *inside* of the intermediates should be 8 in., 8 in. and 10 in. respectively from top to bottom, the last staple being 6 in. from the foot of the inside of the intermediate standard (Fig 4, HH). Wires 2 ft. apart, seven in number, are stretched on the *outside* of the intermediates from end to end and are supported by staples on the intermediates (Fig. 4, MM).

The roof is made of corrugated iron sheets, No. 24 gauge. The wood couples are 7 in. by 3 in. (Fig. 4, NN) on which

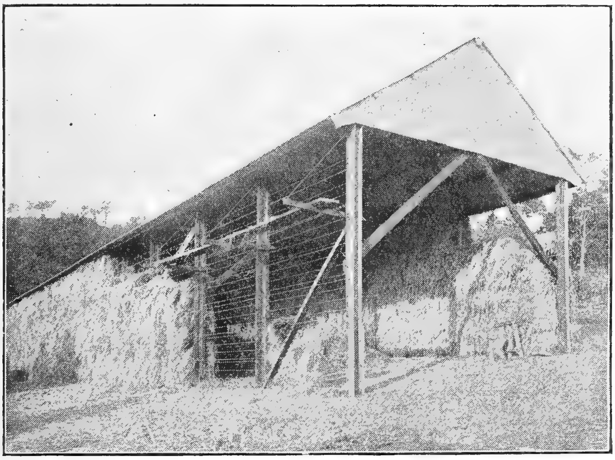


FIG. 2.—South Side and Front of Shed.

are nailed wood bars, 6 in. by 2 in. (Fig. 5, OO), to which the corrugated sheets are attached by bolts and nuts.

Cross wooden stays, $6\frac{1}{2}$ in. by $2\frac{1}{2}$ in. (Fig. 4, PP), are bolted to every alternate intermediate standard and every alternate couple to keep the structure rigid, and every couple has a cross beam underneath, $6\frac{1}{2}$ in. by $2\frac{1}{2}$ in. (Fig. 4, TT), bolted at each end to the couples.

Three buildings or layers of 5 ft. each will be found most convenient. One building from the ground and two from platforms are thus required.

The platforms are formed of two battens supported on three brackets (Fig. 8). Three iron clasps are bolted to every

standard, including the strainers, at the necessary heights (5 ft. and 10 ft.), into which the end of each bracket is pushed up to a notch in the wood of the bracket, and an iron hook is fixed to the other end.

An iron rod is hung to a hook fixed to the standards at the required height, and is attached by a few links of a chain to the hook on the end of the bracket. The brackets and rods can be fixed up or the platform moved in a few minutes.

Two persons can build to one forker, and, what is of the utmost importance, any ordinary farmhand can build.

When filling the wires, raise the second lowest wire off the supporting staple and hang it on an "s" hook to the wire immediately above, so as to allow room for the first wire to be filled with sheaves. When the lowest wire is filled let down the wire above to its original place and lift up the one above it, then lay the sheaves across the one wire, the stubble end of the sheaf resting on the stubble end of the one underneath. The next and other wires are filled in the same way.

When the first *outside* wire is reached a handful of the stubble end of every third sheaf (or of every second if the crop be a short one) should be passed underneath the outside wire and the sheaf drawn outwards till the outside wire nearly touches the band of the sheaf. The double wires at these regular intervals give a downward slope to the sheaf as in a well built stack, they further prevent the mass of sheaves from slipping outwards, acting like a "through-band" in a wall, and further, they admit ventilation between this row of sheaves and the set below.

Air holes may be left at intervals if necessary, according to the condition of the crop. Newly-cut dry grain can be packed more closely than grain which has been soaked with rain after cutting.

When the wires on both sides of the shed are filled about 20 ft. of space is left in the centre, about 14 ft. of which are available for building well-got grain as in a stack, or grain which has been on the wires for a few days in good winning weather may be transferred from the wires to the centre and the wires are thus ready to fill again.

Sufficient space must always be left between the solid grain in the centre and the grain on the wires to ensure a thorough

draught of air from end to end of the shed. When the shed is quite full both ends should be closed with $\frac{1}{4}$-in. mesh wire netting to keep out birds.

The end of the shed should face the direction of the prevailing wind to secure a through draught, and it should not be put in a sheltered position ; the most suitable site is alongside a macadamised farm road.

If the sheaves are dry when " wired " they cannot be packed too closely together, and though damp must not be packed too loose, as the wires keep the weight of the sheaves above from pressing on those beneath. This, in fact, is one of the secrets of the success of a shed of this description ; no matter

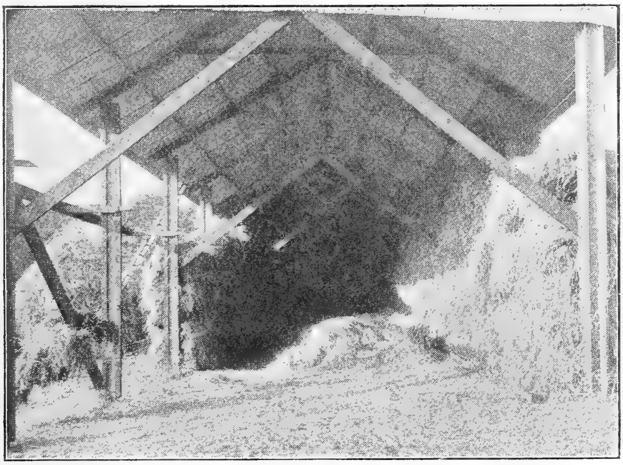


FIG. 3.—End of Shed.

how damp the sheaves may be they cannot press closely together, air can always obtain access laterally as well as longitudinally, and grain not in good condition is bound to improve. The wires require to be moderately tight and can be easily made tighter by screwing up the straining eye-bolts.

A shed of the dimensions of the one described will hold on the wires, and built solid inside, about 40 acres of an ordinary crop. The wires can be filled with barley sown with grass straight from the binder without being stooked, and in a few days, if the weather be favourable, it can be threshed out, and the wires again filled with other grain, which after a few days good weather may be transferred to the inside of the

shed, another 12 acres of crop being secured in this way. If the crop is "wired" very wet, as it can be, it will necessarily require longer time to get into condition, but it is certain to improve.

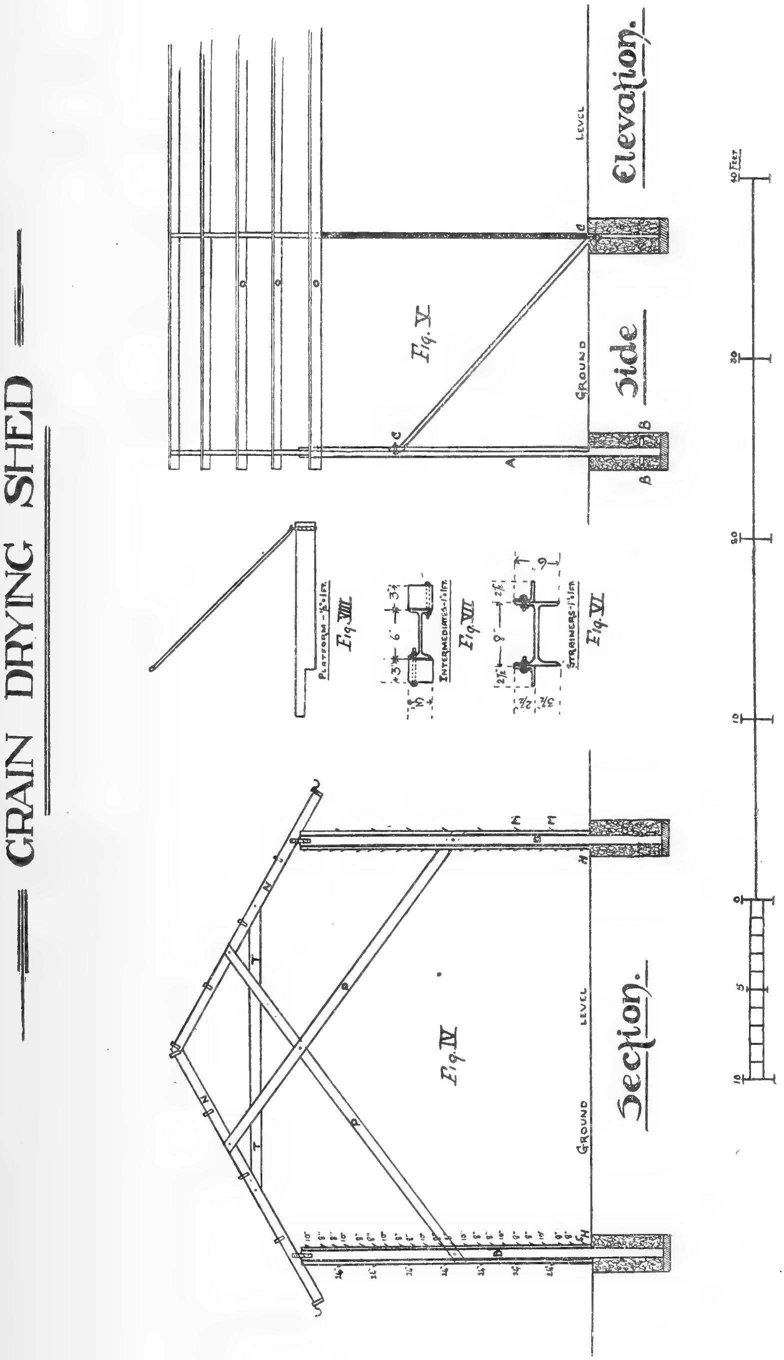
The quantities and measurements of the iron, &c., used in the erection of this drying shed are as follows :—

22 steel joists, 6 in. × 3 in. × 13 lb., each 20 ft. long. ;
4 ,, ,, 6 in. × 3 in. × 13 lb., each 16 ,,
4 ,, ,, 8 in. × 6 in. × 30 lb., each 20 ,,
8 ,, angles, 2½ in. × 2½ in. × ⅜ in., each 16 ft. long ;
66 lengths of Rylands best drawn galvanised steel wire, No. 6, 148 ft. each length ;
750 galvanised staples, 2½ in. × 4 lb. G ;
66 galvanised straining eye-bolts, 12 in. × ½ in. ;
25 gross 2½ in. patent galvanised driving screws with washers ;
4 gross 2 in. galvanised bone-head nails ;
300 galvanised sheets corrugated iron, 8 ft. × 8 ft. 3 in. × 24 G ;
96 yards cast-iron rhones ;
2 stop-ends and 2 drops ;
Six 6-ft. lengths of 2½ in. cast iron down pipes ;
50 yards galvanised plain ridging, 15 in. girth and 24 lb. G ;
6 doz. bolts, 2 in. by ⅝ in. ;
5 ,, ,, 1½ in. × ½ in. ;
21 only bolts, 5½ in. × ½ in. ;
345 ,, ,, 4 in. × ½ in. ;
22 ,, ,, 4½in. × ½ in. ;
68 ,, ,, 3 in. × ⅜ in. ;
32 co-screws, 2½in × ⅜ in. ;
60 screws, ¾ in. × ¼ in. ;
56 lb. galvanised hoop for rhone straps.

The advantages claimed for this grain-drying shed are not confined to saving grain and straw in a bad season. The crop can be carted straight from the binder without being stooked, and each day's cutting secured by night. No thatch, ropes, props, kilns, or bosses are required, and the moving of stooks in bad weather is obviated. No skilled hands are necessary to "wire" the grain—any ordinary labourer can do this. It dispenses with keeping on extra hands at high wages in a late harvest and the owner of such a shed can have all his hands employed filling the wires when other harvest work is at a standstill.

The grain gets into condition much more quickly than in a stack and invariably the weight per bushel is increased and the quality of the grain is superior.

In a good season all crops round woods, hedgerows and in sheltered positions can at once be "wired" after being cut, and thus what on most farms even in a favourable harvest would be of secondary quality is by means of the drying shed made equal to the best.


GRAIN DRYING SHED
Elevation.
Side
Section.
Fig. V
Fig. IV
Fig. VIII
Fig. VII
Fig. VI
GROUND LEVEL
GROUND LEVEL
40 FEET

A drying shed of the same size as this one can be erected for about £150, and the Board of Agriculture have recognized sheds of this description as improvements coming within the terms of the Improvement of Lands Acts, and for which, therefore, they may sanction a charge on the estate.

The result is that a proprietor is enabled to obtain the full sum necessary to erect a drying shed on the usual conditions that the principal with interest is repaid within a specified term not exceeding twenty years.

A yearly payment of about £9 would thus be all a farmer would require to pay for a drying shed of this size, which sum he would more than save in thatch and ropes alone, irrespective of the many other advantages already mentioned.

EXPERIMENTS WITH THE MILK OF NEWLY-CALVED COWS.

PROFESSOR DOUGLAS A. GILCHRIST, M.Sc.

During the past summer experiments with the milk of newly-calved cows have been made at Offerton Hall, the Dairy Research Station for County Durham, which is controlled by Armstrong College, Newcastle-upon-Tyne. The main object has been to ascertain the period after calving at which the milk of newly-calved cows may be sold as normal milk. This work has been done at the request of the Board of Agriculture in connection with a question arising out of a prosecution for milk adulteration, the point being whether the liquid known as colostrum could properly be sold as milk. (See *Journal*, vol. xiii, July, 1906, p. 249.)

Colostrum and "biestings" are the names usually given to the milk of newly-calved cows. Colostrum has a rich yellow colour and is considerably more viscid than ordinary milk. It is easily coagulated by heat, owing to the large amount of albumen it contains. Only a small amount of albumen is present in milk. Occasionally the colostrum is reddish in colour owing to the presence of blood.

Samples of the milk of newly-calved cows were collected by Mr. J. McLaren, Junr., the superintendent of the station, and forwarded to Mr. S. H. Collins, M.Sc., F.C.S., Lecturer in Agricultural Chemistry at Armstrong College. The results of Mr. Collins's analyses of these milks are given in the tables below.

Cow No. 1.—Calved 7th May, 1907.

	First Day. Morning. Per cent.	Noon. Per cent.	Evening. Per cent.
Water	78·46	79·46	79·76
Total solids	21·54	20·54	20·24
Albumen and casein	14·85	13·05	10·37
Milk sugar	1·81	2·37	2·80
Ash	1·13	1·16	1·24
Nitrogen	2·33	2·05	1·63
Specific gravity	1·0635	1·0577	1·049

The foregoing figures give a good idea of the composition of colostrum for the first whole day after calving. On the average, normal milk contains about the following :—Water, 87 per cent. ; casein, 3 per cent. ; albumen, ·4 per cent. ; milk sugar, 4·75 per cent ; fat, 3·6 per cent. ; and ash, ·75 per cent. The average specific gravity of milk is 1·032. In all Mr. Collins's results the fat was very irregular and the results with this constituent were worthless to further the objects of this enquiry. The high total amount of albumen and casein is entirely due to abnormal albumen, while milk sugar is considerably under, and ash considerably over, the average.

In the following cases the determinations were continued until the sixth or seventh days after calving. The mixed milk is a mixed sample of the two or three milkings of one day. The following contractions are used : M, morning ; N, noon ; E, evening :—

Cow No. 2.—Calved 20th May, 1907.

—	First Day. M.	N.	E.	Second Day. Mixed.	Third Day. Mixed.	Fourth Day. Mixed.	Fifth Day. Mixed.	Sixth Day. Mixed.
	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.
Water... ...	77·7	82·32	83·68	—	—	—	—	—
Total solids ...	22·30	17·68	16·32	—	—	—	—	—
Albumen and casein ...	17·50	12·14	10·34	7·40	5·87	5·23	4·53	4·27
Milk sugar ...	1·64	3·22	3·81	3·75	4·40	4·87	4·25	4·28
Ash	0·48	0·96	0·68	—	—	—	—	—
Nitrogen ...	2·78	1·90	1·62	1·16	0·92	0·82	0·71	0·67
Specific gravity	1·0682	1·0553	1·0523	1·0470	1·0397	1·0384	1·0385	1·0375

Cow No. 3.—Calved 20th May, 1907.

—	First Day.	Second Day.		Third Day. Mixed.	Fourth Day. Mixed.	Fifth Day. Mixed.	Sixth Day. Mixed.	Seventh Day. Mixed.
	E.	M.	E.					
	Per cent.	Per cent.	Per cent.	Per cent.	Per cent	Per cent.	Per cent.	Per cent.
Water... ...	73·48	80·06	82·40	—	—	—	—	—
Total solids ...	26·52	19·94	17·52	—	—	—	—	—
Albumen and casein ...	17·41	11·98	8·36	6·25	5·10	4·98	4·27	4·21
Milk sugar ...	1·76	2·30	3·20	3·57	2·69	4·03	3·50	3·87
Ash	0·86	0·68	0·90	—	—	—	—	—
Nitrogen ...	2·73	1·87	1·31	0·98	0·80	0·78	0·67	0·66
Specific gravity	1·0615	1·0470	1·0402	1·0368	1·0323	1·0328	1·0332	1·0335

Cow No. 4.—Calved 28th May, 1907.

—	First Day.	Second Day.			Third Day. Mixed.	Fourth Day. Mixed.	Fifth Day. Mixed.	Sixth Day. Mixed.	Seventh Day. Mixed.
	E.	M.	N.	E.					
	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.
Albumen and casein	16·84	16·02	12·12	14·54	5·48	4·91	4·08	3·83	3·57
Milk sugar...	1·72	2·73	3·11	3·03	4·19	3·72	3·57	3·82	4·31
Nitrogen ...	2·64	2·51	1·90	2·28	0·84	0·77	0·64	0·60	0·56
Specific gravity ...	1·0720	1·0560	1·0495	1·0550	1·0382	1·0400	1·0318	1·0365	1·0365

Cow No. 5.—Calved 31st May, 1907.

—	First Day.		Second Day.			Third Day. Mixed.	Fourth Day. Mixed.	Fifth Day. Mixed.	Sixth Day. Mixed.	Seventh Day. Mixed.
	N.	E.	M.	N.	E.					
	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.
Albumen and casein ...	23·47	22·01	19·65	15·31	8·29	6·70	4·40	4·27	4·15	4·08
Milk sugar	0·73	1·10	1·48	2·44	2·01	3·60	4·25	4·86	4·24	4·25
Nitrogen	3·68	3·45	3·08	2·40	1·30	1·05	0·69	0·67	0·65	0·64
Specific gravity	1·0740	1·0720	1·0685	1·0585	1·0625	1·0418	1·0365	1·0398	1·0377	1·0367

From the foregoing figures it will be seen that in the first milk taken after calving the percentage of albumen and casein varies from about 15 to about 23 per cent., by far the larger amount of this being albumen. These soon become reduced in quantity. On the fourth day they are on the average only a little under 1 per cent. over the seventh day. Another constituent—milk sugar—was present in the first of all the milkings to less than half the normal amount, being considerably under 2 per cent. This had increased to the normal, however, in all cases but one after the third day. The specific gravity was in all cases abnormally high in the first milkings, but by the end of the third day this comes within the limits of normal milk. The ash constituents vary considerably at first but they also soon become normal.

Albumen, casein, and milk sugar are the most abnormal constituents of the milk of newly-calved cows, and the following tables show how these constituents vary during the first seven days :—

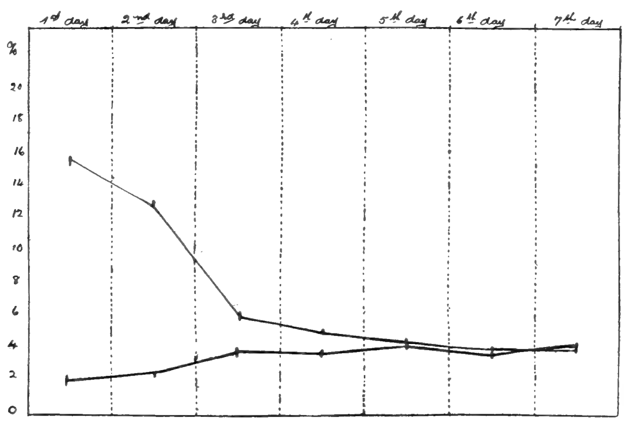
VARIATIONS in percentages of Albumen and Casein.

Cow.	First Day.			Second Day.			Third Day. Mixed.	Fourth Day. Mixed.	Fifth Day. Mixed.	Sixth Day. Mixed.	Seventh Day. Mixed.
	M.	N.	E.	M.	N.	E.					
No. 1 ...	14·85	13·05	10·37	—	—	—	—	—	—	—	—
No. 2 ...	17·50	12·14	10·34	—	7·40	—	5·87	5·23	4·53	4·27	?
No. 3 ...	—	—	17·14	11·93	—	8·36	6·25	5·10	4·98	4·27	4·21
No. 4 ...	—	—	16·84	16·02	12·12	14·54	5·48	4·91	4·08	3·83	3·57
No. 5 ...	—	—	22·01	19·65	15·31	8·29	6·70	4·40	4·27	4·15	4·08
Average	15·77			12·62			6·07	4·93	4·46	4·13	3·95

VARIATIONS in Percentages of Milk Sugar.

Cow.	First Day.			Second Day.			Third Day. Mixed.	Fourth Day. Mixed.	Fifth Day. Mixed.	Sixth Day. Mixed.	Seventh Day. Mixed.
	M.	N.	E.	M.	N.	E.					
No. 1 ...	1·81	2·37	2·80	—	—	—	—	—	—	—	—
No. 2 ...	1·64	3·22	3·81	—	3·75	—	4·40	4·87	4·25	4·28	?
No. 3 ...	—	—	1·76	2·30	—	3·20	3·57	2·69	4·03	3·50	3·87
No. 4 ...	—	—	1·72	2·73	3·11	3·03	4·19	3·72	3·57	3·82	4·31
No. 5 ...	—	0·73	1·10	1·48	2·44	2·01	3·60	4·25	4·86	4·24	4·58
Average	2·10			2·67			3·94	3·88	4·18	3·96	4·14

From the foregoing figures it will be seen that the casein and albumen are 12 per cent. above the normal on the first day and on the third day are only 2½ per cent. above the normal. The latter would be even less if all the cows had calved on the morning of the first day. The milk sugar also has practically reached the normal on the third day. There are certain characteristics of the milk of newly-calved cows which do not disappear for a few weeks, but these affect the milk to a very slight extent and do not interfere with its use for all practical purposes. These results can be seen at a glance in the following diagram :—



THE UPPER LINE SHOWS THE AVERAGE PERCENTAGE OF ALBUMEN AND CASEIN, THE LOWER LINE THE PERCENTAGE OF MILK SUGAR.

It may fairly be assumed, as a result of these and other investigations, that the milk of newly-calved cows may be used for all ordinary purposes at the end of three complete days from calving, provided the milk is then free from blood and is apparently normal.

The popular opinion that "colostrum" or "biestings" is unwholesome is quite an erroneous one. Excellent "biestings" cheeses have been for long and are still made in some of our rural districts, the simple heating of this milk being sufficient to coagulate it into a cheesy condition. These cheeses will keep for a short time only. These, as well as various puddings prepared from this milk, are nutritious and palatable. It should not be so used, however, if the milk is at all tinged with blood.

WATER SUPPLY FOR VILLAGES.

The scarcity of water from which many villages have suffered during the past few years can hardly have been unanticipated by careful observers of the meteorological conditions which prevailed in the affected districts during the periods preceding the scarcity. The summer of 1906 was particularly fine and dry, and the rainfall for the whole year below the average; but the significant fact as regards the water-beds was that the winter of 1905–06 crowned a succession of winters of remarkable dryness.

Whilst scarcity is usually most pronounced towards the end of a dry summer, and is, indeed, popularly ascribed to summer dryness, the real cause is to be sought in scanty rainfalls during the preceding winter, for the winter rains, little needed as they are for the nutrition of vegetation at the time of their appearance, and fairly secure from evaporation by the sun's rays, are largely absorbed by the earth and thus constitute the means of replenishment of the vast underground water-beds upon which well users depend for their supplies during the drier months which follow. The summer rains, on the contrary, are either taken up by growing crops or evaporated from the surface by the heat of the sun almost as soon as they fall.

Computations by careful observers go to show that the degree of infiltration of the rainfall during the period from December to March inclusive is as high as 85 per cent., whilst that for the months of June, July and August is less than 2 per cent.

So great, in fact, are the needs of some forms of vegetable life during the warmer months of the year that an oak tree having about three-quarters of a million leaves will (according to Pettenkofer) take up out of the earth and evaporate through its leaves about eight and a-half times the amount of rain falling during a whole year upon the ground which it covers.

It will thus be seen that, even though the summer rains may suffice for superficial seasonal needs, they are ordinarily insufficient to restore to the subsoil the large volumes of water annually *drained upwards* by the roots and fibrous "suckers" of trees both large and small.

It may be of interest to note, in passing, that as a consequence of the water-greed of trees, shallow wells situated in the vicinity of woods are usually the first to "give out" during a period of scarcity.

Happily for the persons chiefly concerned, such periods are rarely of long duration in this country, but the inconvenience and insanitation resulting from them are not the less regrettable, in view of the fact that with a little more initiative and enterprise most village communities could not only insure against such ills, but could positively add considerably to the amenities of village life.

Although much has been done under the provisions of the Public Health Acts by rural district councils to provide the communities within their jurisdiction with good water services, much still remains to be done in this direction.

Most villages in England and Wales are still dependent for their inconstant and sometimes polluted supplies upon their series of shallow wells which, perhaps, represented the *summum bonum* of a century ago, but for which the only excuse to-day is the cost in money of a better system.

As this matter of cost may, owing to lack of data, operate as a deterrent to the due consideration of individual water schemes, a few estimates, based upon actual experience, may be of service to those interested.

It should, however, be premised that these estimates would only apply to *average* conditions, which may be taken to comprise a moderately compact village of 500 inhabitants (100 houses) situate in an ordinary agricultural district where (owing to a liability to surface pollution) the impounding of a stream is inapplicable and where, therefore, water must be pumped from a deep well into a service reservoir.

The sites of the well and reservoir and the means of service would, of course, in all cases need to be decided by an expert engineer after due consideration of the geological and other conditions of the area to be served, but it may be stated that the choice of a means of pumping is limited to (a) the windmill, (b) the oil engine, (c) the ordinary gas engine, and (d) the suction gas engine.

Taking the cost of a tube well at £80, then, for a windmill installation the cost of well, mill, pumps, reservoir, mains, sluice

valves and hydrants, with installation charges, will be about £940, and the annual charge, including interest and sinking fund at 7 per cent., together with repairs and wages, about £95, which gives *per head of population* a capital cost of £1 17*s*. 5*d*. and an annual charge of about 3*s*. 9½*d*.

For an oil engine installation the capital cost would be about the same as for the mill installation, but the annual charge would probably be about £30 higher owing to cost of fuel and insurance, and these figures would give charges of £1 17*s*. 5*d*. and 5*s*. per head respectively.

The capital cost of a gas engine installation should be about equal to the foregoing, but the annual charge would, of course, largely depend upon the price of gas in the district; assuming, however, that 3*s*. 6*d*. per 1,000 ft. would represent the average, £125 per annum is probably a fair estimate, and in this case the capital and annual charges are again £1 17*s*. 5*d*. and 5*s*. per head respectively.

Suction gas plant, the latest innovation for pumping, is doubtless more costly at the outset than the other means referred to, but the economy in fuel over either the oil or ordinary gas engine goes far to balance this initial disadvantage. With such an installation the capital cost would probably reach £1,100 and the annual cost be reduced to £80, thus giving rates per head of £2 4*s*. and 3*s*. 2¼*d*. respectively.

No provision has been made in the foregoing estimates for costs of supervision other than those which would fall naturally under the heads of construction and periodical repairs, it being assumed that an unpaid committee of the Council concerned would discharge such duties.

THE BRITISH CROPS OF 1907.

A preliminary statement of the estimated yield of the cereal, pulse and hay crops in Great Britain was issued on 20th November, and that relating to roots and potatoes on 3rd December. The average produce per acre in the present year of each of these crops is given in the following table, which shows also the excess or deficiency as compared with the result

in 1906 and with the average of the preceding ten years' harvests :—

Crop.	Yield per acre in 1907.	Difference from—	
		Yield in 1906.	Average yield of 1897–1906.
	Bushels.	Bushels.	Bushels.
Wheat	33·97	+ 0·31	+ 2·75
Barley	35·26	+ 0·68	+ 2·12
Oats	43·04	+ 2·49	+ 3·75
Beans	34·50	− 0·23	+ 5·00
Peas	29·44	− 0·77	+ 2·34
	Tons.	Tons.	Tons.
Potatoes	5·43	− 0·63	− 0·32
Turnips and Swedes	14·11	− 0·11	+ 0·96
Mangold	19·85	+ 0·06	+ 0·68
	Cwts.	Cwts.	Cwts.
Hay, from clover, etc.	32·97	+ 3·76	+ 3·41
Hay, from permanent grass ...	27·23	+ 4·72	+ 3·24
Hops	8·33	+ 3·07	− 0·48

From this table it appears that the average yield this year of each crop exceeds that of the average of the ten-year period, with the exception of potatoes and hops, where there is a deficit.

Considering the results more in detail, the following table shows the total production and yield per acre in Great Britain of each of the cereal and pulse crops during the past two seasons :—

Crop.	Estimated Total Produce.		Estimated Yield per acre.		Average of the Ten Years 1897-1906.
	1907.	1906.	1907.	1906.	
	Quarters.	Quarters.	Bushels.	Bushels.	Bushels.
Wheat	6,901,166	7,386,471	33·97	33·66	31·22
Barley	7,545,066	7,569,179	35·26	34·58	33·14
Oats	16,800,285	15,423,105	43·04	40·55	39·29
Beans	1,328,669	1,246,361	34·50	34·73	29·50
Peas	592,091	564,473	29·44	30·21	27·10

The total production of wheat shows a decline of some 485,000 quarters, which is attributable to the decrease in the area planted in 1907 as compared with the preceding year, as there was an increase of one-third of a bushel in the average yield per acre. Compared with the ten years' average

the yield shows an excess of $2\frac{3}{4}$ bushels per acre, a result to which each of the three divisions of the country contributed. Scotland, although having a yield slightly above the ten-year mean, nevertheless had nearly a bushel per acre less than in 1906, as had Wales. The average yield in Great Britain as a whole has only been exceeded, since official statistics of production have been collected, in 1898, when an average of 34·74 bushels per acre was recorded.

The production of barley very nearly equalled that of last year, the decrease being only 24,000 quarters, in spite of the decline of the area under this crop. This result is due to the large yield in England of 35·66 bushels to the acre, exceeding the average of the previous decade by $2\frac{3}{4}$ bushels, and being the highest figure on record for this country. Both Wales and Scotland were below the ten-years' average, the deficit in Scotland reaching nearly $1\frac{1}{2}$ bushels; but the average for Great Britain as a whole was just over 2 bushels in excess of the ten-year mean. It is just half a bushel below the highest noted, viz., 35·75 in 1898.

The total production of oats is nearly a million and a-half quarters more than in 1906, and the crop now harvested is, with one exception, in 1894, the largest ever recorded. As in barley, this result is mainly due to the large yield in England, although both Wales and Scotland had more than the average. The yield per acre for England was returned at 46·66 bushels, or $5\frac{1}{4}$ bushels above that for the period 1897–1906, and is the highest yet recorded for that country. The yield of 43·04 bushels per acre for Great Britain is $3\frac{3}{4}$ bushels above the decennial mean, and is also the highest on record.

Beans and peas, though not reaching the high records established in 1906, are still much in excess of the average; beans to the extent of 5 bushels and peas nearly $2\frac{1}{2}$ bushels per acre; and last year is in fact the only one with a bigger yield. Owing to an increased acreage, however, the total production in the case of both these crops is greater than that of last year, while the total production of beans has only once previously, in 1890, been exceeded.

The estimated total produce and yield per acre of the potato and root crops are given below:—

Crop.	Estimated Total Produce.		Estimated Yield per Acre.		Average of the Ten Years 1897 to 1906.
	1907.	1906.	1907.	1906.	
	Tons.	Tons.	Tons.	Tons.	Tons.
Potatoes	2,977,910	3,428,711	5·43	6·06	5·75
Turnips and swedes	22,059,972	22,627,840	14·11	14·22	13·15
Mangold	8,935,456	8,538,480	19·85	19·79	19·17

It will be seen that the average yield of potatoes per acre is almost two-thirds of a ton less than in 1906, and one-third of a ton less than the average of the last ten years; while the total production falls short of last year by 450,000 tons. Wales shows the worst results, the yield there this year being exactly 1 ton below the average.

The yield of turnips and swedes is very slightly below that of last year, but nearly a ton above the average of the previous decade. The best results occur in England, where the yield is nearly $1\frac{3}{4}$ tons over average; Wales has slightly over a quarter of a ton in excess of the average; but Scotland shows a deficit of nearly three-quarters of a ton.

The yield of mangold is just over that returned last year, but nearly three-quarters of a ton over the 10 years' average, and the total production exceeds that of 1906 by some 400,000 tons. The area devoted to this crop in Wales and Scotland is relatively small, and only contributes a small proportion to the total crop; the yield in the former, however, was $1\frac{1}{2}$ tons over the average, but in Scotland a deficiency of $2\frac{1}{4}$ tons per acre was recorded.

The total production and yield per acre of hay and of hops are shown in the following table:—

Crop.	Estimated Total Produce.		Estimated Yield per Acre.		Average of the Ten Years 1897–1906.
	1907.	1906.	1907.	1906.	
	Tons.	Tons.	Cwts.	Cwts.	Cwts.
Hay from Clover, etc.	3,709,631	3,200,969	32·97	29·21	29·56
Hay, from permanent grass...	6,719,257	5,383,564	27·23	22·51	23·99
	Cwts.	Cwts.			
Hops	374,129	245,688	8·33	5·26	8·81

An increased yield is recorded in both classes of hay, both as compared with last year and with the average for the ten years, in Great Britain. In the case of hay from clover and rotation grasses there is an excess of nearly 4 cwts. to the acre in England over the average, in Wales of 2½ cwts., and in Scotland of nearly 1¾ cwts., producing in Great Britain as a whole an average yield per acre of nearly 3½ cwts. over the preceding ten years. In hay from permanent grass England had nearly 3½ cwts. over average, Wales 2¼ cwts., but Scotland only ½ cwt. more than the mean. The net result for Great Britain is a crop of meadow hay 3¼ cwts. more to the acre than the average. By adding the production of the two crops together a total of nearly ten and a-half million tons of hay will be seen to have been secured, or nearly two million tons more than was obtained last year.

The average yield per acre of hops was over 3 cwts. in excess of the very low yield of 1906, but fell nearly ½ cwt. short of the decennial average. The total production was 374,000 cwts., as against 246,000 cwts. last year.

Summing up the results of the harvest of 1907, two features stand out prominently. Firstly, and chiefly, the abundance of the production in Great Britain as a whole, the yield of all the cereals and pulse crops as well as clover hay being within measurable distance of record; while meadow hay and roots are also heavy crops. Only potatoes and hops fall somewhat below the 10 years' average. The second noteworthy feature is the fact that England has this year fared much better than Scotland: all the crops have yielded, relatively to their average, more abundantly in the south, although barley, turnips and swedes, and mangold are the only crops, in addition to potatoes, which actually gave less than the 10 years' mean in Scotland.

Cultivation of Lavender.

Lavender has long been grown in this country for the production of oil of lavender. The species cultivated for this purpose (*Lavandula vera*) is an evergreen shrub about 2 ft. in height. It was introduced into England in 1568 and flourished remarkably well under cultivation, yielding an oil far superior in delicacy of fragrance to that obtained from the wild plant or from the same plant

cultivated in any other country. In a favourable locality a single plant will form a bush 5 ft. in diameter if not crowded by other plants and throw up spikes nearly 5 ft. high. An open situation and dry soil is best, as the plant fails to thrive in a moist situation, while a rich soil furnishes too much nutriment and the plant runs to leaf. English-grown lavender at one time supplied the bulk of the oil used in this country, but some years ago a disease manifested itself in the plantations with the result that the acreage decreased and the price of oil rose rapidly. This was followed by an increase in the importation of French oil and subsequently by a great diminution in values. The English oil, however, is still considered the best and generally fetches the highest price.

Mr. J. C. Sawer, F.L.S., in his "Odorographia"* gives detailed information as to its cultivation at the present time and the chief points are summarized below.

The principal lavender plantations of England are in the districts of Mitcham, Carshalton, and Beddington in Surrey, Hitchin in Hertfordshire, and Canterbury in Kent. The Surrey and Hertford plantations are situated on the outcrop of the chalk which surrounds the London basin. The most suitable conditions of soil are found to be light brown loam over chalk, the depth of the loam being very slight, varying from 6 to 20 in. On slopes there is hardly any soil at all in some parts, while in some of the hollows it is as deep as 4 ft. There is often a thin seam of Coombe rock, of a soft, dry, pulverulent nature, light brown in colour, between the loam and the chalk, which is very beneficial to the plant. In selecting ground, a site should be chosen which slopes rather to the south or south-west. A wood or copse on the south-west boundary is of some advantage to ward off or break the force of gales which may occur in July; but in the autumn and winter months, the plants having been clipped present little resistance to the wind. A July gale may do some damage; the tall spikes wave like corn in the wind, but with such weight and momentum as to cause the woody branches sometimes to split at the junction with the stem. Tall trees in the immediate vicinity are objectionable, keeping off too much

* "Odorographia: A Natural History of Raw Materials and Drugs Used in the Perfume Industry," by J. C. Sawer, F.L.S., 1907. (Gurney and Jackson.)

light and air. Hedges should be cropped very close and low, and walls of any sort are objectionable.

In cleaning the ground preparatory to planting, all weeds should be carefully rooted out, stacked in small heaps and burned, the ashes being afterwards distributed over the ground. It is advisable to prepare the soil previous to planting by trenching in a quantity of short straw and stable refuse, but not much dung. Wood ashes can be used to advantage. The ground should be allowed to lie fallow until the spring, when all weeds should be again cleared and the whole ploughed over. In May, according to weather, the young plants can be dibbled into their places, in rows north to south, 4 ft. apart and 6 ft. between the rows. Some growers plant much closer, but this decreases the flower-bearing capacity of the plant, and makes it difficult to keep the ground clear of weeds and to cut the flowers.

A stock cannot be produced from seed, but cuttings can be taken from established plants; they should be of young growth and taken at the joint with a heel; they will strike freely between May and October. Young shoots strike more readily than woody branches and produce more compact plants. They should be put in 3 or 4 in. apart, shaded from the sun and watered. They can be transplanted the following spring to their proper place. Mild moist weather should be selected for putting them out. The practice of roughly taking cuttings or clippings of branches, and striking them thickly planted together in rows or trenches is bad. Plants propagated in this way have to be dragged apart, thus tearing the bark, injuring the roots, and so inducing fungoid disease. Weeds should be kept carefully under, but as the lavender roots spread near the surface the blade of the hoe should be only 1 in. deep.

The young plants should be prevented as far as possible from flowering the first year, by clipping them with shears; this throws the strength into the lateral shoots and makes the plants bushy and compact.

Some growers clear out all the plants after five years and substitute potatoes or other vegetables. This may be avoided by clearing off a portion of the older plants every year if the whole plantation was not planted at once. These old plants

should be burned and the ashes distributed. The land can then be ploughed, manured, cross-ploughed, and left fallow till the next May when it may be stocked with young plants.

The harvest depends on the season, but as a general rule may begin in the first week of August, if the weather be dry. In wet weather it is better not to cut at all. The best oil is obtained in hot droughty seasons.

Mr. J. C. Sawer describes the method of distillation adopted and states that an average yield of 25 lb. weight of oil per acre may be obtained, but much depends on the energy and personal superintendence of the grower and care in the distillation. The value of the oil varies, but is now about 22*s*. a lb.

Cultivation of Brewing Barley.

The following "golden rules" for the cultivation of barley have been issued by the Experiment Station for the Brewing Industry in Berlin for the guidance of German farmers. The advice given is likely to prove of interest to English barley growers, though it will be remarked that most of the "rules" are those usually observed in the best barley-growing districts of Britain :—

SEED.—(1) Till the ground as early as the condition of the soil will allow. (2) Use the best, pure seed, free from smut. (3) If the seed is bought or comes from a field that shows signs of smut, it should be treated with a half per cent. solution of copper sulphate.* (4) The drills should not be too far apart (6 to 8 ins.) Do not spare the seed. (5) Avoid sowing clover with barley.

Varieties.—(6) The Chevalier barleys are the best, but they require very careful cultivation and good soil, and are especially sensitive to strong nitrogenous manuring. (7) Imperial barleys therefore should be preferred where the soil is highly nitrogenous or where owing to unfavourable weather the Chevalier and other sorts may be expected to suffer from "lodging" and damage to quality. (8) For dry soils the Hanna barleys are most suitable. These barleys also deserve consideration for better soils on account of their prolific yields.

Manuring.—(9) Brewing barleys require rich and easily assimilated stores of plant-food. (10) This is supplied by

* Treatment for the prevention of Smut and Bunt is given in Leaflet No. 92.

heavy manuring with potash salts and superphosphate. For light soils, potash is especially important; barley should be grown after hoed crops, not after leguminous plants. (11) Great care is necessary in applying nitrogen, because nitrogen makes the barley rich in albumen and therefore of less value for brewing purposes. The manuring and the production of the preceding crop must be taken into consideration. The application of farmyard manure should be avoided. (12) The disadvantageous effect of nitrogen on the quality may be largely controlled, to the advantage of the total yield, by heavy manuring at the right time with potash and phosphoric acid, as well as by careful cultivation. The potash should be put on early, even in the autumn.

Cultivation.—(13) The soil should be so prepared that the spreading of the delicate roots of the barley may meet with little mechanical hindrance. (14) On all light soils the provision of moisture during growth must be secured by deep cultivation, working the soil in the autumn, by taking barley after hoed crops, by early seeding, harrowing and destruction of weeds. (15) In clay soils an excess of water must be avoided by careful tillage, which keeps the soil in a favourable mechanical condition; a crust must not be allowed to form on the surface.

Harvesting.—(16) The barley must be fully ripe before being harvested. (17) If the barley is quite dry, it should be carried immediately it is cut. (18) If for any reason this cannot be done, the barley must be immediately tied into sheaves and put into stooks.

Threshing, Marketing, &c.—(19) Care should be taken to avoid injury to the grain in threshing, as this decreases the value. (20) The greatest care should also be taken in the preparation of the barley for sale, as the dressings, &c., are valueless to the brewer, but can be usefully used for fodder. (21) Barley of uniform quality should be offered for sale in as large lots as possible. (22) Agricultural associations can very greatly assist small farmers to grow barley profitably by buying seed in common and by issuing advice as to methods of cultivation. (23) Damp barley must be protected from injury by drying, as if the grain germinates it becomes useless for brewing.

General Directions.—Brewing barley should be rich in starch,

poor in nitrogenous compounds and thin skinned, and of these qualities a low nitrogen content is the most important. If barley is nitrogenous it keeps badly in store and easily loses its germinating capacity. Whilst the appearance of the grain is of great assistance in judging its qualities, the nitrogen content can only be ascertained accurately by analysis. With a view of assisting farmers the Brewing Institute at Berlin carries out such analyses at a low fee, but farmers are advised to attend the Barley and Hop Exhibition as the best way to make themselves acquainted with the characteristics of the finest brewing barley.

The Corn Marigold.

The Board recently received from Northallerton, specimens of the corn marigold (*Chrysanthemum segetum*, Linn.), a beautiful but destructive weed, which was reported to be doing much damage. An attempt had been made to eradicate it by taking four successive green crops, but the weed was stated to be as flourishing as ever. The present year has been very favourable to its growth, and it has practically destroyed 2 acres of barley and nearly destroyed a third, the 2 acres being so bad that harvesting of the crop was not attempted.

The corn marigold is an erect, composite plant, attaining 1½ ft. in height, and bearing beautiful golden-yellow flower heads some 2 in. in diameter, flowering taking place from June to September, or even as late as October. The "seeds" of the corn marigold are very light and very easily blown from one field to another, while they are also said to lie dormant like the seeds of charlock. For this reason alone it is a most difficult weed to extirpate. Both seeds and flower heads are poisonous, and chaff containing many should therefore not be given to stock, but should be destroyed. Thäer says the seeds pass through the digestive system of horses, &c., without losing their vitality, and where chaff contains only a few seeds it would be advisable to steam it well before use. Fream says of this plant*: "It is possessed of great vitality, and, when pulled up and thrown aside, does not perish and decompose, but continues growing and ripens its seeds." Seeds are produced in very large numbers.

* *Complete Grazier*, p. 858.

The following extract* is of interest in connection with *C. segetum* :—" This plant may still be found in our cornfields, although careful farming has greatly diminished its places of habitation, and shortly it may find the garden its only place of refuge. It is a very troublesome weed to the farmer, particularly in the turnip fields of Norfolk, on a sandy soil. In Denmark there is a law to oblige farmers to root it up out of their fields ; and Threlkeld states, in 1727, that in Britain 'Maunour courts do amerce careless tenants who do not weed it out before it comes to seed' ; a laudable practice worthy of being retained."

The preventive and remedial measures suggested are as follows :—

(1) Sowing seed absolutely free from the seeds of the corn marigold, especial care being taken to this end if the seed grain is grown in the neighbourhood.

(2) Destruction of all seeds in chaff and thrashing refuse by steaming.

(3) Hand-pulling of any large plants, and the thorough hoeing of several successive root crops in order to prevent any of the plants seeding. All removed plants should be *burnt*.

(4) Seeds which have fallen should be allowed to germinate, and the young plants destroyed by surface cultivation and hoeing.

As the plant is an annual, the utmost care should be taken *every year* to prevent seeding. By persistent efforts, even the seeds which may be lying dormant for a time will be destroyed. Neighbouring farmers should be encouraged to co-operate in destroying the weed, as the seeds may easily be carried from farm to farm.

Fairy Rings and their Eradication.

In reference to the note on Fairy Rings in this *Journal*, August, 1907, p. 296, some remarks by Mr. G. H. Robinson, Assistant Vegetable Pathologist, Victoria, are of interest. (*Agricultural Gazette*, New South Wales, August, 1907.) It is stated that of all the causes which operate against the formation and maintenance of a good, even turf in bowling greens, golf links, and lawns in general, perhaps none is more

* *Sowerby's English Botany*, Ed. iii., Vol. 5, p. 40

potent, in Melbourne and its suburbs at least, than the fairy-ring puff-ball, *Lycoperdon polymorphum*, Vitt. For ten years or more the fungus has been defying the efforts of the caretakers of the Melbourne bowling greens to eradicate it, and until recently nothing short of digging out the affected areas was regarded as satisfactory. Such a method, though practicable where the rings are few and small, is out of the question when large and numerous, owing to the difficulty of securing a level surface after the work, and in a green so treated the remedy would probably be worse than the disease. Within the last two years, however, a cheap and effective method of eradication has been found, so that the fairy ring ceases to occupy the position of a dangerous enemy, and may be regarded as a parasite easily destroyed.

It may be mentioned that the name of "Fairy Ring" has been given on account of the curious effect of the fungus upon the grass where it is found. The spawn of the fungus draws its nourishment from the roots of the grass, and spreads always in an outward direction to all points of the compass, so that shortly after a green has been infected and during the latter part of summer a number of darker coloured, narrow circular bands or rings may be seen, less than a foot wide, but with a diameter of a few or several feet. In these rings the grass is at first so much deeper in colour than the rest that they are easily seen from a considerable distance. It used to be said that this richer green was due to the dancing of fairies; hence the name fairy rings. Soon, however, a change for the worse is observed; the grass in the ring becomes thin, though still retaining its deeper hue; much of it dies away, resulting in an uneven surface, and a great number of small puff-balls are formed. If the turf is cut and rolled every day these puff-balls often escape notice, since in such cases they scarcely exceed the size of a pea; but, growing unchecked, they may reach a diameter of an inch or more, and may be nearly 2 in. high.

About ten years ago Mr. McAlpine, Vegetable Pathologist of Victoria, made some experiments with various fungicides, and it appeared that a solution of sulphate of iron might overcome the disease, but the experiments were not conducted long enough to be conclusive. In April, 1905, Mr.

G. H. Robinson was requested to make an effort to eradicate the pest on a bowling green in Victoria. Some preliminary trials were then made on a small scale, plots being treated with a solution of iron sulphate, Bordeaux mixture, copper-soda and copper sulphate solution. It was soon found that mixtures like Bordeaux and copper-soda, with their bulky gelatinous precipitates, were useless for the work, for the material could not be made to permeate the soil so as to reach the spawn of the fungus. Of the others, a copper sulphate solution of 1 oz. per gallon, using half a gallon per square yard on three occasions a week apart, was found to injure the grass before eradication was complete. Fortunately, the plot treated with sulphate of iron was doing well, no puff-balls appearing after three applications of a solution of rather less than 1 lb. in 5 gallons of water at intervals of a week, though, of course, it was then impossible to say whether the fungus had been entirely destroyed. The only sure sign of eradication is the absence of fairy rings and puff-balls in the next season.

The measure of success achieved with sulphate of iron appeared sufficient to justify its use over the whole green, the rings being then so numerous that it is doubtful if an area of 30 square yards was free of them. The green was therefore divided into plots of 60 square yards, putting on that area 8 lb. of sulphate of iron dissolved in 30 gallons of water. The solution was made in barrels and applied with ordinary zinc watering cans, one man using two at a time, one in each hand. The evening previous to the application the green was well watered, and after the solution was applied a further light watering was given to assist to convey the solution down to the roots. The green was closed two days prior to the first application, and it was found that where much trampling had occurred when play took place the iron sulphate blackened the grass to some extent, but no lasting injury resulted. Little effect was observed from one application beyond a deepening of the colour of the grass and a marked reduction in the number of puff-balls. Three additional treatments were given, four in all, at intervals of a week, and only two puff-balls were gathered on the whole green after the second dose, though before the first it would have been no hard task to collect a barrowful. Since the third treatment, no puff-balls have been

seen on the green, and two whole seasons have passed with no trace whatever of anything in the shape of a fairy ring. Owing to the large amount of sulphate of iron used, over a ton to the acre, it was deemed advisable to give a heavy dressing of lime to reduce any remaining in the ground to a harmless state. A week after the last application, quick-lime, freshly slaked to a fine powder, was evenly spread over the surface at the rate of 1 ton per acre.

The success of these operations was so pronounced that other greens similarly affected are being treated this autumn. A few precautions should be taken by those who try this method. Chief amongst them is the necessity for keeping the ground moist, while on no account must the dressing of lime a week after the last treatment be omitted. The area to be treated is better left without rolling, and it is well to cut the grass only once a week during the work, say two days before each application. Though four doses were given, it is possible that three would prove sufficient, but less than that might leave some spawn uninjured in the soil to form the centre of another outbreak. The autumn—when the fungus is actively growing—is the proper time for the work; in the height of summer, or in the depth of winter, the prospects of success are not so good, while the risk of injury to the grass is greater.

The Use of Felspathic Rocks as Fertilisers.

In view of the need for potash as an agricultural fertiliser and of the fact that the potash deposits in Germany represent the only known source of raw potash, interest has been revived in the United States in the use of ground felspar as a manure, a subject which has attracted no attention in this country since Dr. Aitken's experiments were published twenty years ago in the Transactions of the Highland and Agricultural Society. Felspar is a mineral in which alumina and other bases, such as potash, soda, lime, are combined with silica. Orthoclase felspar, a silicate of alumina and potash, should contain nearly 17 per cent. of potash, but in many of the felspars the potash is to a greater or less extent replaced by soda or lime or both. Granite consists of felspar, quartz and mica in varying proportions; and ordinary granite may contain from 3 to 5 per cent. of potash.

The question whether fine-ground felspar can be used as a potash fertiliser has frequently been discussed on the Continent, and in a Bulletin (No. 104) published by the Bureau of Plant Industry of the United States Department of Agriculture, a review is given of the various experiments which have been conducted in past years on this subject, from which it appears that the conclusions reached have not been very definite.

It may be admitted that the potash contained in ground felspar is at least in some part available as a plant food, but the question whether it can be made sufficiently available under certain conditions to be an economical substitute for concentrated and soluble potash salts remains to be determined. A very important point is the degree of fineness to which the felspar can be ground.

The suggestion has also been made that the potash could be extracted from the rock by chemical and electrical processes. This has not yet been done on a commercial scale, but it has been done in the laboratory, and the method is described in a recent United States Bulletin (Office of Public Roads, Bulletin No. 28). Briefly, it consists in converting the ground felspar into slime by adding water containing a small quantity of hydrofluoric acid. This slime is placed inside a suitable wooden vessel and a current of electricity is passed through it. The alkali set free by the action of the acid is carried away, while the acid appears to be used over and over again. Finally, a material is obtained in which the potash which has been set free is soluble and available. It is hoped that further investigation will result in the discovery of a commercial method for making the potash contained in felspathic rocks completely available.

Live Stock Import Regulations, Natal.

The regulations relating to the importation of animals into Natal, which were summarised in this *Journal*, Vol. xiii, November, 1906 (p. 489). have been amended by an Act dated 10th September, 1907, whereby all cattle imported into Natal by sea, except those accompanied by certificates given by qualified veterinary officers approved of by the Minister of Agriculture, are upon their arrival to be quarantined until tested with tuberculin, and not released

until certified to be free from tuberculosis. If an animal proves to be affected with tuberculosis it is to be destroyed. The owner may, however, have the option of returning or re-shipping the animal, in which case it must be taken direct from the quarantine station to the vessel.

The reason given for the amendment of the original Act is that it has been found that animals have arrived in Natal accompanied by certificates signed by veterinary surgeons, and on being tested in Natal have been found to be affected with tuberculosis. As such veterinary certificates do not constitute a sufficient safe-guard to the colony, it is considered necessary that all imported cattle should be tested with tuberculin. It is optional to the Minister of Agriculture whether cattle imported by land shall be tested or not. These regulations do not apply to cattle imported solely for purposes of slaughter.*

Feeding Pigs on Maize and Maize Meal.

For the past ten years the Wisconsin Experiment Station has been testing the value of feeding maize in comparison with maize meal (as the main portion of the ration) for fattening pigs. During this period eighteen trials have been made with 280 pigs belonging to various breeds. The amount of food required to produce 100 lb. of gain varied from 360 lb. to 820 lb. The poorest gains were made when maize alone was fed to young pigs averaging 84 lb. in weight at the beginning of the trial. This emphasizes what is a common experience among pig breeders, that an exclusive diet of maize is not desirable and is especially to be avoided with young pigs. The evil effects of this kind of food were shown in diminished appetite and gains, and in the large amount of feed required to produce 100 lb. of gain.

---

* Live Stock import regulations have been published in this *Journal* for the following countries:—United States, Sept., 1906 and Sept., 1907; Argentina, Jan., 1905, April, 1905, Oct., 1905, and June, 1906; New South Wales, April, 1905; Germany, May, 1905; New Zealand, June, 1905; South Australia, July, 1905; France, Aug., 1905; Belgium, Sept., 1905; Uruguay, Oct., 1905; Victoria, Nov., 1905; Spain, Dec., 1905; Queensland, Jan., 1906; Western Australia, Feb., 1906; Tasmania, March, 1906; Transvaal, June, 1906; Ceylon, Cape Colony, Sept., 1906; Holland, Malta, Oct., 1906; Natal, Austria-Hungary, Nov., 1906; Russia, Hungary, Dec., 1906; Iceland, Italy, India, Feb., 1907; Isle of Man (sheep), Ireland, March, 1907; Canada, Isle of Man (swine), Jamaica, April, 1907; Norway, Sweden, Isle of Man (sheep), July, 1907; Great Britain (horses), Nov., 1907.

The best gains for feed consumed were made with young pigs where the grain consisting of equal parts by weight of maize and middlings, was supplemented by a small allowance of skim milk. The pig feeder is warranted not only in using a variety of grains, but will find it to his advantage to add skim milk whenever it can be obtained.

On the average of the ten years it appears that the pigs fed with whole maize consumed 501 lb. of grain per 100 lb. of gain, while the pigs fed with maize meal only ate 471 lb. of grain for the same result.

Where there is plenty of time for maturing the pigs, and it is not necessary to secure the maximum daily gain, it is doubtful if it pays to grind maize for pigs, but the test shows that where quick maturity is an important item better results are secured from the maize-meal. Pigs fed with maize-meal eat more grain and make somewhat larger daily gains. It can be used to good advantage in finishing pigs which were first fed on maize. Changing over to maize-meal near the close of the feeding period also furnishes a useful change in the character of the ration.

Import of Feeding Stuffs into Germany.

A report which has been received through the Foreign Office from His Majesty's Consul-General at Hamburg (Sir W. Ward, C.V.O.) gives some information as to the importation into Germany of food for live stock. There has been recently, owing to the high prices of meat, a substantial increase in the number of cattle and pigs, and the consequence of this increase has been that, in spite of the abundant crops of all kinds of fodder in Germany in 1906, there was last year a considerable rise in the demand in Germany for the leading descriptions of feeding stuffs for live stock, comprising oilcake and oilcake-meal, bran, rice-meal, malt-sprouts and potato-residue, which are imported from foreign countries.

The great importance of the German import trade in these articles may be inferred from the fact that during the year 1906 the total value of such imports amounted to nearly ten millions sterling: the imports of oilcake and oilcake-meal (601,293 metric tons) being valued at £3,925,000, the imports of bran (1,089,724 metric tons) at £5,074,500, and the imports of

rice-meal, malt-sprouts and potato-residue (202,318 metric tons) at about £1,000,000. Of these amounts 16,393 tons of oilcake, 42,946 tons of bran and 10,446 tons of rice-meal, &c., were imported from Great Britain. The total imports of each class increased in 1906 compared with 1905, those of oilcake by 3 per cent., of bran by 10 per cent., and of rice-meal, &c., by nearly 50 per cent. The comparatively slight increase in the imports of oilcake and oilcake-meal during 1906 is ascribed by some persons to the exceptionally high price of raw materials, such as copra, palm kernels, &c., and partly to the abundant crops of all kinds of fodder in Germany last year. Others, however, are of opinion that German agriculturists have of late years been more in favour of using bran and rice-meal for feeding purposes in preference to oilcake and oilcake-meal, and that the causes of the comparatively smaller demand for the latter in 1906 are not, therefore, of a merely temporary character.

American Gooseberry Mildew.*

The disease known as the American gooseberry mildew, *Sphærotheca mors-uvae*, Berk., is of a very serious character, and has rendered the cultivation of gooseberries unprofitable wherever it has appeared, and in some cases even impossible.

This fungus is much more injurious to gooseberry bushes than the allied European gooseberry mildew, *Microsphaera grossulariae*, Lev. (Leaflet No. 52), as it not only attacks the leaves, but also extends to the shoots and fruit, stunting the latter and rendering it unsaleable.†

Such a description of the fungus is given here as will aid fruit-growers to recognize the disease, and at the same time it has been considered advisable to include (1) precautions to be observed by gooseberry growers, (2) suggestions for the prevention of the disease, and (3) instructions for the treatment of infected bushes, the after-treatment of infected plantations,

* Two memoranda issued by the Board on this subject appeared in the *Journal*, Dec., 1906, p. 560, and April, 1907, p. 44, and a short description of the disease (with coloured and other illustrations) was given in the May number, p. 104. The information given above is contained in the revised edition of Leaflet No. 195, which will shortly be issued. Copies may be obtained free on application.

† Occasionally the English mildew assumes a virulent form and attacks the fruit.

and the procedure to be adopted in cases where the disease is suspected.

Description and Life History.—The disease usually first appears as a delicate white mildew on the expanding leaf-buds, extending later to the young wood and fruit. The mildew generally becomes visible during the latter half of May or the first half of June, when it appears in the form of "glistening frost-like spots" on the fruit on the lower part of the bush, where there is usually dense shade. It then spreads to the leaves and tender shoots. In its earlier stages it has a cobwebby appearance, which soon becomes white and powdery owing to the development of the light conidial spores.*

During the summer and autumn great numbers of spores are produced, which are conveyed from infected to healthy shoots or adjoining bushes by wind, rain, insects, &c. The patches of mildew gradually change from white to a dingy brown colour, and at a later stage become densely studded with the winter fruit, which appears in the form of very minute black dots. The spores contained in the winter form of fruit germinate the following spring and give rise to the white summer mildew.

In this country the fungus appears to be mostly confined to the tips of the shoots, which, when badly affected, present a brown and shrivelled appearance, somewhat similar to that produced by an attack of "green fly." On such shoots, if carefully examined, especially with the aid of a magnifying glass, the brownish patches of mildew studded with black winter fruit can be readily seen.

Precautions.—All nurserymen and market-gardeners who purchase gooseberry bushes or *Ribes aureum* (the stock upon which the standard gooseberry bush is worked) should observe the following precautions :—

(1) Only to purchase from those growers or dealers who are prepared to offer a guarantee that the plants they are selling are of their own growing, and that no case of American gooseberry mildew has ever appeared in their gardens or in the immediate neighbourhood, and that the said plants have not been near any gooseberry plants recently brought on to the seller's premises.

* Reference should be made to the illustrations given in the May issue of the *Journal*.

(2) To plant such gooseberry bushes or stocks as they may buy or acquire from other premises than their own in a special part of their nursery or garden at some distance from other gooseberry bushes.

(3) To keep a careful watch on all gooseberry plants for any signs of mildew, and to report any appearance suggestive of the disease to the Secretary of the Board of Agriculture and Fisheries, 4, Whitehall Place, London, S.W., immediately it is detected. In the case of any county or district to which a Gooseberry Mildew Order of the Board applies,* notice of the disease, or of its suspected appearance, must at once be given to the local authority instead of the Board.

(4) To assist the Board in discovering any unreported cases of the disease.

Prevention.—With the object of preventing the disease from gaining a hold in their plantations, all gooseberry growers who live in districts in which the disease has been discovered should frequently make a careful inspection of their bushes, and treat any suspected bushes as described below; but whether suspected bushes are met with or not growers should spray at regular intervals throughout the summer and autumn.

Unfortunately the winter stage of the fungus is so well protected that none of the sprays in ordinary use affect it, and there is very little chance that any kind of spray would prove effective; but throughout the whole summer stage, which lasts about as long as the bushes are in leaf, sprays may be used. They are then most valuable both in destroying the fungus and in rendering bushes less liable to infection by the spores; and although spraying by itself cannot be relied upon to cure an outbreak, it is a measure which should never be neglected.

In spring, from a fortnight to three weeks before the young leaves appear, the bushes should be thoroughly sprayed with Bordeaux mixture.† For use as soon as the buds open, and while

* Up to the time of going to press, the Board have made American Gooseberry Mildew Orders which apply to the Counties of Gloucester, Worcester, Isle of Ely, Lincoln (parts of Holland), Norfolk, Warwick, Derby, Cambridge, Leicester, Nottingham, Huntingdon and Hereford.

† To prepare Bordeaux mixture, 20 lb. of sulphate of copper (98 per cent. purity) should be dissolved in cold water in a wooden vessel, and 10 lb of pure, fresh quicklime should be slaked in a separate vessel. Gritty "thin" lime, or lime with a slaggy surface, should be avoided. Enough water should be poured on it to cause it to crumble, and the operator should not hurry the process, but wait for it to occur.

1 2 3 4

Branches showing the Winter condition of American Gooseberry Mildew.

Figs. 1 and 2. On shoots of red fruited Gooseberry (Lancashire Lad).
Fig. 3. On shoots of green fruited Gooseberry.
Fig. 4. A portion of Fig. 3 enlarged, showing the winter fruit of the fungus.

the leaves remain on the bushes, the best spray is made by dissolving liver of sulphur (known to pharmaceutical chemists as *Potassa sulphurata*) in water. For the first spraying 1 lb. of liver of sulphur may be used in 48 gallons of water, but thereafter not less than 1 lb. in 32 gallons should be employed. Spraying should be repeated at intervals of from 7 to 20 days according to the state of the weather and the danger of infection apprehended. Spraying should be done on a dry day in order that the spray may have time to dry upon the bushes. If it is necessary to spray in wet weather stronger spray fluids should be employed. If heavy rain should fall immediately after spraying the work should be repeated as soon as possible.

Treatment of Suspected and Infected Bushes.—Should any suspicious symptoms be discovered on the plants in spite of the precautions already mentioned, the case should at once be reported to the Board, or, where an Order of the Board applies, to the local authority. A few slips of bushes showing the disease in its most marked form should be cut off and sent carefully packed in a strong wooden or metal box (not a cardboard box) with the report to the Board or to the local authority as the case may be. The postage on letters and packages sent to the Board by letter post need not be prepaid.

The following instructions are for the guidance of growers, who must remember that during the summer and autumn months the *spores* which spread the infection are readily carried from plant to plant.

1. *Bushes Suspected.*—Wherever there is reason to suspect the disease, growers, after reporting as explained above, should immediately destroy as much of the *mildew* which may exist as possible, by spraying thoroughly all suspected plants or groups of plants, and all plants in their immediate neighbourhood (to

More water should then be added, gradually working it down to a stiff cream, finally reducing it to a thin cream ("milk of lime"), which will mix directly with the bulk of the water. If this process is faithfully carried out, when the mixture is made up a flocculent, starch-like precipitate is formed, and this precipitate will stick. A granular precipitate is valueless. The "milk of lime" should be poured through a fine sieve or a piece of close sacking to remove grit. The copper sulphate solution and "the milk of lime" being separately prepared, the contents of the two vessels should then be poured together into a tub and the whole made up to 100 gallons. If the mixture is correctly made and safe to use, the blade of a knife held in the mixture for a minute should remain unchanged; if the blade becomes coated with copper more "milk of lime" should be added until copper is no longer deposited.

which infection may have spread), with a solution containing 1 lb. of liver of sulphur to 32 gallons of water. The bushes should subsequently be carefully pruned, and the prunings burnt.

2. *Diseased Bushes.*—When bushes are known to be diseased, either the entire bush, or, should the owner prefer to resort to pruning, all the wood formed in the current and preceding years must be destroyed at once. Except in those cases in which bushes may be easily pruned growers are strongly recommended to destroy affected plants; a brief delay at first may greatly increase the work which the grower will subsequently be called upon to do. The readiest means of destruction will vary in different cases.

(*a*) When the gooseberries form an unmixed plantation, with no "top" fruit, the diseased bushes, if in groups, may be set on fire with the aid of straw or other dry material, or they might be sprayed with paraffin and fired, thus ensuring total destruction.

(*b*) Where the diseased bushes are under "top" fruit, or occur scattered through the plantation, burning on the spot cannot be practised. In such a case, therefore, the bushes should either (1) be dug out (and subsequently burnt) after a preliminary spraying with 1 lb. of liver of sulphur to 32 gallons of water, to kill the fungus and prevent it spreading to surrounding bushes, or (2) the diseased bushes should be thoroughly sprayed with a 10 per cent. solution of copper sulphate (1 lb. to 1 gallon of water). This will destroy both fungus and bushes, and in two or three days the bushes should be grubbed up and burnt.

If rain should fall soon after spraying, and the liver of sulphur or copper sulphate is washed off, the bushes should be sprayed again as soon as they are dry.

It would not be safe to attempt to cut down or dig out affected bushes during the summer and autumn, until after they have been sprayed, as the spores might be shaken off and carried by wind or on clothing to healthy plants.

The site of any leaf-bearing bushes or parts of bushes which have been destroyed should be sprayed with a solution containing not less than 1 lb. of liver of sulphur in 24 gallons of water in case any diseased leaves or fruit should have fallen to the ground and escaped destruction.

(*c*) If the disease is discovered during the winter months, the entire bushes or all the wood formed during the current or preceding year must be at once removed and destroyed. As the spores of the fungus are not distributed in winter a preliminary spraying is unnecessary.

3 *After-Treatment of a Plantation in which Disease has occurred.*—The healthy bushes in the plantation should be sprayed with a solution of 1 lb. of liver of sulphur to 32 gallons of water as soon as the diseased bushes have been disposed of. The spraying should be repeated within a week and be continued at intervals of ten days throughout the rest of the season.

In the late autumn, as soon as growth has stopped and the leaves have begun to fall, all the bushes in an infected plantation should be pruned. Disease occurs almost entirely on the young wood, and if the current year's wood be removed and destroyed by burning or by steeping in a solution of copper sulphate, the danger of disease re-appearing in the following summer will be greatly diminished. The sooner pruning is done after active growth has ceased the better ; so long as the young shoots remain on the bushes there is always the danger that undiscovered fragments of the fungus dropping on the soil will infect it. Suckers should be carefully removed while pruning.

Early in the new year, and at the latest some weeks before the buds begin to swell, the soil of the plantation should be dug over, and the surface soil buried as deeply as possible. During the winter months the fungus exists in a dormant state, but as soon as spring comes new spores are produced which infect the buds of gooseberry bushes. Burying the surface soil would considerably lessen the chances of fresh infection.

American gooseberry mildew has also attacked red currants, and there is reason to believe that it may attack black currants and raspberries ; these plants should therefore be kept under observation by fruit growers.

Should it be necessary to destroy a gooseberry plantation because of mildew, it would be highly undesirable to re-plant the land with gooseberries or currants until a considerable time had elapsed. It is not certain how long the infection may remain in the soil, but growers should let two years at least

pass before again stocking their ground with bushes. In forming new plantations they should place them as far away from infected land as is practicable.

The coloured plate facing p. 546 illustrates the winter stage of the disease.

American Gooseberry Mildew in Worcestershire.

The Board have received from the Worcestershire County Council the following information as to the existence of American Gooseberry Mildew in that county. This brings up to date the particulars given by Mr. K. G. Furley in last month's issue of this *Journal* :—

On 13th November a careful inspection was made of the gooseberry plantations at Lenchwick and Pinvin, which had been officially treated on behalf of the County Council for American Gooseberry Mildew. There are ten plantations at Lenchwick and three at Pinvin. The disease is very bad in one plantation ; bad in three or parts of three plantations ; and slight in seven plantations. The whole of these plantations have been sprayed ; ten have been sprayed seven times and one five times.

In the case of two plantations the results are more satisfactory so far as they go. Two rows of Red Warrington were reported to be diseased last spring ; they were pruned but not sprayed, and at the present time show no signs of disease. This was also the case with an adjoining plantation which was affected last spring, where the trees had been pruned by the owner and sprayed seven times.

Summer Pruning.—In the case of one plantation at Lenchwick which was badly affected ; part of the plantation near the road and occupied by young trees was pruned in July. This part of the plantation was almost free from disease. Very slight traces of the disease were found, and it must be classed as very lightly affected.

A gooseberry plantation at Uphampton was found to be diseased last spring and the following measures were adopted : (1) severe pruning ; (2) immediate spraying with the "Woburn Wash," consisting of $1\frac{1}{2}$ lb. sulphate of copper, 2 lb. caustic soda, 5 pints paraffin, $\frac{1}{2}$ lb. quicklime to $9\frac{1}{4}$ gallons of water ;

(3) spraying as soon as the leaves expanded with $\frac{1}{2}$ oz. liver of sulphur to 1 gallon of water, the strength being increased to $\frac{3}{4}$ oz. per gallon as the leaves and young growth increased in vitality.

On the 24th October this plantation was inspected and no disease was found; neither was any disease found in any plantation near or in any part of Ombersley on that date, nor again in November.

Insect Agencies as a Cause of Larch Canker.

Among the problems which for some time have been engaging the attention of those interested in the larch is the question of the agencies which play a part in the spread of the larch canker fungus. Certain insects, and among them the *Psocidæ*, are regarded as being in one sense a cause of the disease, as the fungus is able to gain an entry to the tree by punctures or wounds made by the insect.

Some species of *Psocidæ* pass their time wholly among various species of fungi and feed almost entirely upon the minute vegetation. The various members of the *Psocidæ* are very small creatures which undergo a so-called imperfect metamorphosis, being four-winged in their final or mature stage. The species, which is specially referred to in this paper is the Fungus fairy fly, *Caecilius flavidus* (Figs. 1 and 3). The larvæ from the eggs of this species are of very small dimensions but increase to about one-tenth of an inch when the larval stage is completed—that is to say, when they are ready to receive their wings. In the mature condition the length averages one-seventh of an inch, including the wings. The colours are dull, indefinite brownish-grey with darker markings. The head and thorax are very dark in the winged specimens. Although these insects may be very alert they are often very loth to make use of their wings; even while being examined in front of a strong light with nothing whatever to prevent them from flying away they have failed to seek their freedom and it has been necessary actually to dislodge one by a jerk from a needle-point before one has been able to examine it microscopically.

Other writers have noted this occasional disinclination to use the wings, the insects having been known to allow

themselves to be crushed to death without making any attempt to fly.

The formation of the insect may be seen from the illustrations. Fig. 2 shows a specimen bearing on its thorax two pairs of cases containing the wing membranes before these have unfolded; this condition is equivalent to that of the pupal condition of insects with a complete metamorphosis. The larva lacks these wing-cases. The wings are held folded one pair over another and sloping peculiarly along the back, so that in side view a large one only is observable, while viewed from above there is a curious shield-like outline as seen in Fig. 1. These insects

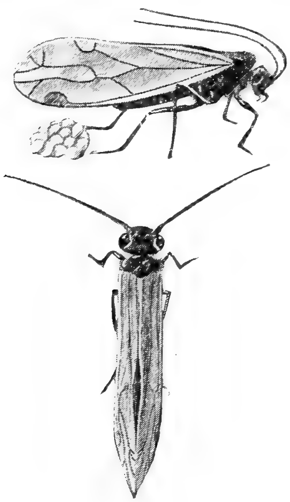


FIG. 1.—The fungus fairy fly (*Caecilius flavidus*) in resting position (magnified).

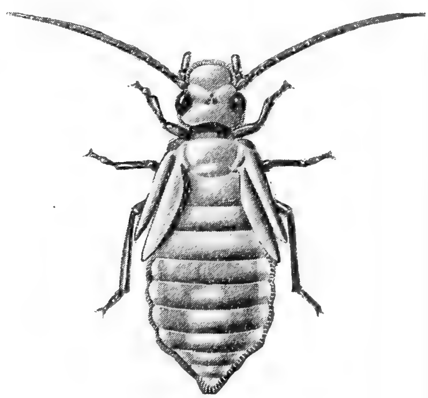


FIG. 2.—Pupa of *Caecilius flavidus*, much magnified.

can be identified by the nervures or veins of the wings; the neuration is irregular and not abundant. The eggs are laid on bark, leaves, fungi, decaying matter, &c.

I have found very large numbers of these insects in the "witches' brooms" of the birch and also among samples of larch canker. Other cankerous states of growing wood also yield them in abundance. In roaming about among their favourite haunts the *Psocids* get densely covered with the fungus spores and so convey them to any fresh districts which they may visit. These *Psocidæ* may live on the fungus and its spores (certain species, for example, live on rust fungi) but do harm by carrying the spores about and so spreading the disease to

fresh places. A larch canker, for example, may arise solely without the intervention of any such insects, and the wind would assist in the spread of the spores, but the chances would probably be against a very great distribution of the contagion in this manner. On the other hand, if the wound should be

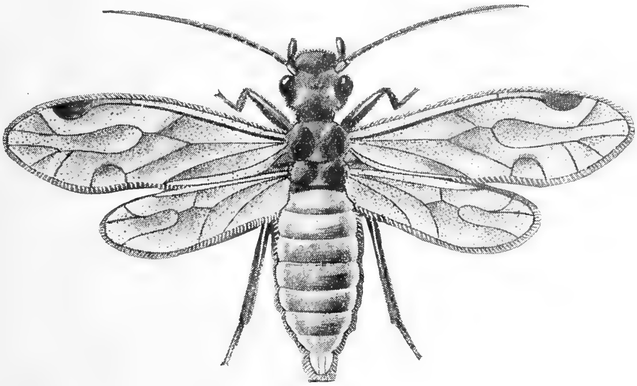


FIG. 3.—Fungus fairy fly (*Caecilius flavidus*) (much magnified).

visited by these insects they would in endeavouring to find other fungus-smitten areas, assuredly carry the spores to trees hitherto healthy, and as a result fresh cankers might arise. At any rate it is hardly possible to examine either a "broom" or a canker without finding numbers of these little insects.

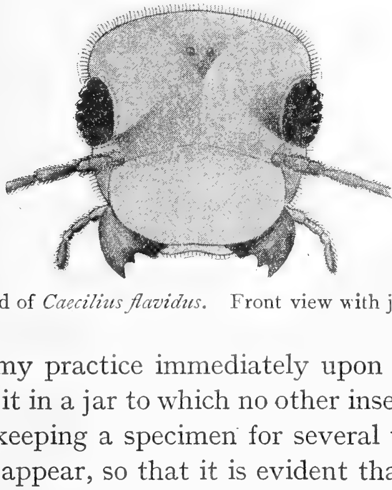


FIG. 4.—Head of *Caecilius flavidus*. Front view with jaws distended.

It has been my practice immediately upon the receipt of a canker to place it in a jar to which no other insects could obtain access. After keeping a specimen for several weeks groups of these creatures appear, so that it is evident that the eggs must have lain concealed within the crevices.

I find that a few mere puffs of tobacco smoke are sufficient to render these *Psocids* lifeless, but with a view to their extermination the chief aim should be the complete destruction by fire of severed diseased portions. Wounds which have not reached too acute a stage may be painted with an emulsion.

Fig. 4 is a magnified sketch of the head and jaws of a *Psocid*. These organs are, of course, minute, yet their characteristics hardly seem consistent with those of insects which are exclusively fungus feeders. Probably the *Psocidæ* nibble the bark so pertinaceously that small wounds are occasioned and thus lead to the admission of fungi; in view of the admitted fact that the tiny punctures of the larch aphis (*Chermes*) are a predisposing cause of larch canker, the subject is worth attention. In answer to the suggestion that the jaws may enable them to feed on other minute insects found in their habitats, I must reply that so far I have failed to find any other species existing side by side with the *Psocids*.

The illustrations are all from nature.

JAMES SCOTT.

Notes on Insect, Fungus and Other Pests.*

BEETLES.—Several enquiries relating to beetles have reached the Board during the last month or two. One correspondent enquires how much gas-lime should be applied for use against wireworms (Leaflet No. 10). Gas-lime may be applied at the rate of three or four tons per acre to land which is to carry an oat or turnip crop the following year. It should be spread as early as possible in autumn in order that it may be thoroughly exposed to the air before the land is ploughed. Gas-lime is poisonous to crops when fresh, owing to the presence of certain compounds of sulphur. If exposed to the air for six or eight weeks, however, it is quite safe. Apart from its effect on wireworms gas-lime forms an excellent dressing for oats, producing a luxuriant growth, while it is also useful on meadows. It is, however, somewhat apt to produce coarse grass and, if used, the hay crop should be cut early.

---

* Notes on insect, fungus and other pests, dealing with the specimens submitted to the Board for identification, and their apparent prevalence, will appear in this *Journal* month by month. The notes commenced with the issue for June, 1907.

Beetles in a Malt House.—A London inquirer sent specimens of the grubs of a beetle found in a malt house, where they were said to be covering the walls, being accumulated in masses on the inner lining of match-boarding and between it and the cemented brick walls.

Owing to the condition of the specimens it was not possible to identify the species. Such an infestation should be treated by fumigating with carbon bisulphide or hydrocyanic acid gas, both of which have already been dealt with in this *Journal* (November, 1905, September, 1906, and October, 1907).

It may, however, be remarked that where the pests are collected in numbers in corners or crevices, or in places not easily accessible, carbon bisulphide might be actually sprayed on them; or such crevices, &c., could have cotton waste, previously dipped in the liquid, thrust into them.

Dr. Howard, the United States Government Entomologist, recommends the use of hydrocyanic acid gas against insects in houses in the proportions of 1 oz. avoirdupois of potassium cyanide (98 per cent.), 1 fluid ounce of commercial sulphuric acid, and 2 fluid ozs. of water.

Store Beetles infesting a Warehouse.—From Chester came an enquiry as to beetles infesting a warehouse, in which they were very troublesome. The beetles were identified as bread or store beetles (*Anobium paniceum*), which breed freely in provisions of various kinds, flour, biscuits, coffee, pepper, ginger, beans, and in various kings of drugs. The beetles have also been found to harm books and manuscripts. The eggs are laid on the food selected, and give rise to small curled, whitish grubs, with horny biting jaws. When full grown the grubs pupate where they have been feeding, and gradually the adult beetles mature. In extremely favourable conditions the whole life-cycle has been known to be completed in two months. Where there is danger of infestation stores should be kept in light, closed receptacles. Fresh Keating's powder is stated to kill the exposed beetles, but this should not be taken for granted, merely because the beetles lie motionless. Such beetles should be swept together and dropped into boiling water, not thrown aside. Where the larvæ and adult beetles are at work they may be destroyed by fumigation, for which sulphur is sometimes used. Fumigation

with bisulphide of carbon or with hydrocyanic acid gas, as referred to above, would be a very effective means of combating *Anobium paniceum*.

FLIES.—From Sevenoaks and Exeter specimens of celery infested by the maggots of the celery fly were received. This pest is described in Leaflet No. 35. Several broods occur during the year, and the maggots have been found in the leaves right into the winter. Specimens of cineraria from Sevenoaks were also infested with a leaf-mining maggot, which may be combated in the same way as the celery fly.

Chrysanthemum Leaf-Mining Fly.—At the end of September specimens of chrysanthemums were received from Newmachar, Aberdeen, and it was found that they were infested with the maggots of a leaf-mining fly. The fly has since been bred out from the material sent, and has been identified as *Phytomyza geniculata* (=*P. horticola*). This fly has a similar life history to the celery fly (*Acidia heraclei*), and the measures recommended in Leaflet No. 35 against this pest should be practised in the case of *P. geniculata*. It may be remarked that this fly can also breed in the sow thistle (*Sonchus oleraceus*) and this is an additional reason why this weed should be eradicated. An Ichneumon fly parasitic on the maggots of *P. geniculata* was also bred out from the specimens sent.

Sciara Fly in Savoys.—On dissecting the roots of savoy plants forwarded for examination from Leicester both wireworms and the maggots of a sciara fly were found. The sciara fly maggots are scavengers and not direct spoilers of the root. Higher up the plant at its apex, where the leaves still remained, galleries of the cabbage root fly, *Phorbia brassicae* (Leaflet No. 122) were also found, while the root was also fungus-infested. The savoys were therefore attacked by wireworms, cabbage root fly, and a fungus, while sciara maggots were present as scavengers.

APHIDES.—Specimens of apple trees sent from Reading and Finchley were found to be infested with woolly aphis see Leaflet No. 34). In one case a larva of a hover fly (see *Journal*, Vol. v., No. 3, December, 1898, p. 328) was found. Hover fly larvæ should be protected as they are very useful, preying on the aphides.

Cauliflowers, Brussels sprouts, &c., from Bolton were found

to have been infested with aphides, which attack wild as well as cultivated cruciferous plants. From May onwards as the season advances aphides migrate from the former to the kitchen garden or to cabbages, &c., in the fields, and it is then they are chiefly noticed. Spraying with washes as recommended in Leaflet No. 104 may be practised. In garden practice $\frac{1}{4}$ lb. soft soap in 1 gallon of water, sprayed several times weekly has proved effective.

HYMENOPTERA.—*Oak Spangle Gall.*—A correspondent forwarded from Gloucester abnormal specimens of oak leaves, and these were found to be covered on the under sides with the common spangle gall, the autumnal form of the currant gall. There can be no doubt that their presence in great quantity is injurious to the trees, though not to a serious extent. A note on this insect appeared at p. 478 of this *Journal* for November, in which the alternation of generations was explained.

From Witney the Board received specimens of wheat attacked by the corn sawfly, dealt with in the November *Journal*, pp. 478–9.

MITES.—Specimens of mites of the family *Tyroglyphidae*, species *Glyciphagus domesticus*, were received from West Horsham. With the allied species *G. spinipes*, these mites are sometimes a great nuisance in houses. They were dealt with in this *Journal* for June, 1907. Mite-infested mushrooms were forwarded from Brighton, and with them were associated two species of springtails.

SPRINGTAILS.—Small white active insects known as springtails or *Collembola* were found in conjunction with the root fly (*Phorbia brassicæ*) on cabbage plants from Skye, and with mites on mushrooms from Brighton. These springtails have long been neglected, partly because the general belief was that they did no damage first hand, but that they were scavengers, being abundant among decaying plant matter. They sometimes occur in excessive numbers, the typical situations being hidden places, in damp earth, moss, &c., a number being usually found together. They bear no wings at any time of their life. Evidence has been accumulating during the past four years and it is now proved beyond doubt that springtails directly attack plants not otherwise injured. Both cabbages and potatoes have been attacked and greatly injured by them. Several species

have been shown to be injurious and some species possess the power of leaping. Springtails breathe only through the skin, and moistness of the skin is a condition necessary for such respiration. These insects are not, therefore, found in dry conditions, and dressings of lime, or lime and soot, may be resorted to for destroying them.

WORMS.—Large numbers of small worms were reported as being found in an orchard at Cardiff. Examination led to the worms being identified as round worms termed *Gordius*, of the sub-order *Nematomorpha*, closely related to the *Nematoda*, to which eelworms belong. The gordius worms have received their name from the fact that they are often found collected and twisted into knots. They are harmless to plants.

FUNGI, &c.—*Ergot of Rye*.—An enquiry has been received from Hitchin as to the result of sowing ergot-infested rye. There would be great risk of infecting the resulting crop if ergot were sown along with rye, and the ergot should be thoroughly dressed out before sowing. When ergot is sown with any cereal it produces spores in the spring when lying on the ground. If these spores are conveyed by wind, insects, &c., to the flowers of the cereal the crop becomes infected.

Diseased Gooseberry Bushes.—Specimens of gooseberry bushes from Warrington were not specifically diseased, but were covered with the green alga *Pleurococcus vulgaris*, which often attacks unhealthy bushes. This alga may be removed by spraying the bushes during the winter months with full-strength Bordeaux mixture.

The mould of *Botrytis cinerea* was present on gooseberry specimens from Potter's Bar. This fungus, however, only causes damage when favoured by an excess of moisture. Bushes infested should be pruned and the prunings burnt.

Diseased Chrysanthemums.—Chrysanthemum leaves from Limpsfield (Surrey) were found to be attacked by the rust *Puccinia Chrysanthemi*, Roze. A certain remedy for this disease is not known, but the fungus may be held in check by spraying with potassium sulphide (1 oz. being employed to 2 gallons of water) during the growing season and autumn months. The strength of the spraying solution may be gradually increased provided the chrysanthemum leaves are not injured. It is very important to collect, and to destroy

by burning, leaves and shoots that have been attacked, in order to minimise as much as possible the chances of re-infection. Cuttings from infected plants should not be used. *P. Chrysanthemi* is now regarded as a distinct species and does not appear to be capable of directly infecting plants of other genera.

Other specimens of chrysanthemums from Belmont (Ayr) were affected with *Sclerotinia sclerotiorum* (see Leaflet No. 127).

Diseased Arums.—Specimens of diseased arum leaves were found to bear blotches caused by a parasitic fungus. Injured leaves should be removed and the plants sprayed at intervals of four days with a rose-red solution of permanganate of potash.

Other specimens submitted for examination were :—Pears from Bath, infested with *Sclerotinia fructigena*, brown rot (Leaflet No. 86) ; apple twigs from Southend-on-Sea, attacked by apple tree mildew (see *Journal*, September, 1907, p. 358) ; and potatoes from Derby, which were attacked by winter rot, *Nectria solani* (Leaflet No. 193).

The Indebtedness of the Peasant Class on the Continent.

Among the subjects discussed at the Agricultural Congress held at Vienna in the spring of the present year was the preservation of the peasant class, and the relief of that body from the crushing burden of indebtedness which weighs on it in so many countries of Europe, and this gave rise to several interesting papers from German and Austrian writers. The subject is chiefly interesting to English agriculturists, as illustrating the conditions under which small holders on the Continent have to work, and the view with which the larger farmers regard them.

Director A. Grimm, of Meran-Obermais, took as his theme the continual increase in the indebtedness of the peasants, which he declared is the first subject mentioned whenever the preservation of that class is discussed. But he regarded measures for the reduction of that debt and the limitation of powers of borrowing in future as merely palliatives unless the net yield of the peasants' holding was increased. For this purpose he recommended (1) the extension and improvement of agricultural education ; (2) old age pensions, and further facilities for agricultural labourers to acquire their own homes ;

(3) the improvement of roads and means of communication, which are declared to be so bad that the carriage to and from the nearest railway station is twice to three times as costly as the freight from America to Europe; (4) the preservation of home agriculture against ruinous competition by a countervailing tariff, and the protection of live stock against the introduction of disease.

A longer and more detailed paper was read by Dr. Carl von Grabmayr, of Vienna, an epitome of which is subjoined. He pointed out that while all are agreed that the future of the peasant class is seriously threatened by its increasing indebtedness, and that means must be taken to check it, unanimity ceases as soon as the causes of the evil are discussed and proposals for dealing with it are mooted. The first question that arises is what is meant by "over-indebtedness," and by general admission it is accepted that the debt is excessive if the produce of the holding is not sufficient to maintain the peasant and his family, and to pay in addition the interest and yearly redemption of the debt; or if the debt exceeds two-thirds of the value of the estate.

A great, if not the greatest, part of the mortgages are entered into when property changes hands either by purchase or inheritance. The custom of paying a deposit on purchase and raising the rest of the price by mortgage is widespread, and is the more dangerous inasmuch as the purchase price often exceeds the "true" value of the holding measured by the net returns. But even when the holding passes by inheritance, debts are often incurred to pay out the co-heirs, and the occupier is induced to take on further liabilities to improve his property, or to meet losses arising from bad management or misfortunes.

The organisation of loans on mortgage is indispensable. It is requisite that the creditor should not be able to foreclose and that the debt should be redeemed by yearly instalments. But private persons are seldom willing to lend on these terms, so the agriculturist is led to apply to banks, which as money-making concerns are bound to exact the fullest security and the highest rate of interest. In Prussia and Austria, on the other hand, there are certain institutions which do not seek for profit, but work only for the benefit of agriculture. If these societies could be established everywhere the chances

of relieving the peasant from debt would be greatly enhanced. But it is clear that the debt must be paid off by the owner himself and from the proceeds of his farm. In order to further this the system of redemption by instalments must be substituted for mortgages, where the capital must be repaid in a lump. This need not entail any dislocation, for the debtor instead of paying 5 per cent. annual interest will pay 4 per cent. interest and 1 per cent. redemption money. But though all thoughtful agriculturists are in favour of such a conversion opinions differ as to the method of carrying it out.

The next point is to devise means by which a repetition of the old state of things can be avoided. This can only be achieved by restricting the freedom to incur debt. How little agreement there is in Germany on the best way of doing this may be gathered from the report of a debate in the Prussian Upper House in 1906, in which every speaker was agreed that something must be done and yet no speaker, not even the Minister of Agriculture himself, believed that the Bill under discussion would produce any notable result. In Austria the situation is better. A policy has been formulated in the proposal that every new agricultural mortgage should only take the form of a consolidated annuity for the redemption of both interest and loan. The thesis is that the peasant needs plenty of cheap easily accessible credit, and that all the radical reforms that have been suggested make that difficult rather than easy. The tendency of the latter would be to drive away the good and industrious holders and to favour the idle and useless. Thus the proposal to abolish distraint would merely penalise the peasant, who has no other security than his holding and the stock on it.

In view of this difficulty another body of reformers propose to put the power of levying an execution in the hands of a peasants' co-operative society. Such a scheme would put all the peasants under a sort of guardianship, and it is not to be supposed that they would accept it. The next proposal is to restrict by law the amount to which a peasant can incur debts. This also has been rejected by the leading circles in Germany and Austria. It has therefore been suggested that the limitation of credit should be optional, and a law to this effect was passed in the Prussian Lower House in 1906, whereby the owner

could, on application, get his power of incurring liabilities defined. This law, which is universally admitted to be "harmless," is naturally without results, since it is clear that peasants without debts will not put it in motion. Finally, there is a school who look to instruction and education as a means of achieving the result. The desire to possess land is, however, so strong that no education will persuade the peasant not to incur debts for that purpose, and as long as a peasant can choose between a debt on which he need only pay interest and a debt which he must redeem, so long will he choose the easier course. These facts and arguments are the justification for the resolutions passed in 1900 and 1901, that "the only basis of loans on real property is to be found in redeemable mortgages that cannot be foreclosed."

The result of such a law as this would be to put a stop to second mortgages. Since all loan societies would restrict their loans to unencumbered estates further loans could only be raised by personal credit. Private lenders cannot, however, afford as a rule to receive their capital back in small instalments, and such a law would act as a restraint on excessive borrowing. This is the chief benefit of the law, but a secondary result would be the liquidation of debts on landed property. For the old mortgages would disappear in thirty to thirty-five years and the second mortgages would rank as first charges.

It is, however, a matter of first importance that a system of credit banks on a stable basis such as the Raiffeisen banks, should exist everywhere. It has, on the other hand, been objected that little is gained by this. Buchenberger has declared that it matters little whether the peasant is burdened with debts on his real estate or his personal credit. To this it is replied that the peasant is less likely to incur debts on his personal credit, since there is a greater need to pay them off, and he will therefore be obliged to practise greater economy. Of course it will not abolish over-indebtedness, since there will always be failures due to misfortune or lack of skill, and it is not proposed to relieve the peasant from all possible risks. If this proposed law were to damage the personal credit of the peasant it might be objected to, but it is claimed that it will improve it. Another remarkable effect claimed for this law is that it will reduce the selling price of land, a result which would be viewed

very differently by different people. Dr. Grabmayr is, however, satisfied that the ultimate effect will be beneficial to the community, since the present tendency is to drive the price of land far above its true worth owing to the national monopoly. It is claimed also that the transition would be gradual. Passing to the question of the effect the new law would have on the sources of credit, it is pointed out that the effect on credit institutions will probably not be harmful, but that private lenders may be seriously affected, although there are exceptions even to this. Finally, such a law would put a stop to the tendency to amend the law of inheritance and would preserve the estates of the peasants intact. It was therefore proposed "that it is indispensable in the interest of the preservation of a sound and capable peasantry to combat their growing indebtedness by mortgage through legislative and administrative means. The first step is to relieve the soil of all debts on it that exceed a certain limit by the formation of loan societies of known solidity, and with this object to transform all debts which the creditor may call in at pleasure into debts which the debtor must pay off by regular instalments. Secondly, to require that all new debts should be contracted in the latter form, except in certain cases, such as when land passes by inheritance or is transferred to near relations. Thirdly, in places where it is the custom for the land to pass to one heir without division it should be illegal to raise accommodation mortgages by other means than by loans repayable by instalments, provided that an agricultural credit bank should be available in every case for the liquidation of the debt."

Supplement to the Journal.

A report on agricultural education in the United States, which has been prepared by Mr. Esmé Howard of the British Embassy, Washington, will be issued with the January number of this *Journal*, price 4*d*. post free. This report, which extends to sixty-two pages, contains a detailed account of the Federal legislation for the establishment of agricultural and industrial colleges in the United States, and a description of the educational system of Alabama, Minnesota and Illinois. Subscribers to the *Journal* can obtain this report for 3*d*.

The Board of Agriculture and Fisheries, by virtue and in exercise of the powers vested in them under the Destructive Insects and Pests Acts, 1877 and 1907, do order, and it is hereby ordered, as follows:—

American Gooseberry Mildew (Prohibition of Importation of Bushes) Order of 1907.

Prohibition of Importation of Gooseberry and Currant Bushes.

1. The landing in Great Britain of any gooseberry bush or currant bush brought from any place out of Great Britain is strictly prohibited.

2. This article shall not apply to the landing of any bush on or before the 31st day of January, 1908, if a licence authorising such landing has previously been obtained from the Board of Agriculture and Fisheries, and is produced if so required by any officer of Customs when the bush is landed.

Penalty for Dealing with Bushes illegally Imported.

2. If any person, without the written consent of the Board of Agriculture and Fisheries, shall, in Great Britain, sell, or expose for sale, or plant any bush which has been landed in contravention of this Order, knowing the same to have been so landed, he shall be liable on conviction to a penalty not exceeding ten pounds.

Power of Entry by Inspectors.

3. An Inspector of the Board of Agriculture and Fisheries or of the Local Authority appointed under the Destructive Insects and Pests Acts, 1877 and 1907, may enter any premises on which he has reason to believe that there are bushes landed in contravention of this Order and examine any bush on such premises, and any person who wilfully obstructs or impedes any Inspector in the course of his duties under this Article shall be liable on conviction to a penalty not exceeding ten pounds.

Provision in case of Discovery of Disease.

4. If on any examination under the preceding Article an Inspector finds any bush which is affected with American Gooseberry Mildew (*Sphærotheca mors-uvae*) he shall forthwith communicate the fact to the Board of Agriculture and Fisheries and serve on the occupier of the premises on which the bush is found, a notice prohibiting, until the notice is withdrawn by a like notice, the removal of any gooseberry or currant bush from those premises, and any person who shall remove any bush in contravention of a notice under this Acticle shall be liable on conviction to a penalty not exceeding ten pounds.

Definitions.

5. In this Order—

"Bush" includes a cutting, stock, or seedling, and any part of a bush, except the fruit;

"Landing" includes introduction through the post.

Commencement.

6. This Order shall come into operation on the 14th day of December, Nineteen hundred and seven.

Short Title.

7. This Order may be cited as the AMERICAN GOOSEBERRY MILDEW (PROHIBITION OF IMPORTATION OF BUSHES) ORDER of 1907.

In witness whereof the Board of Agriculture and Fisheries have hereunto set their Official Seal this twenty-ninth day of November, nineteen hundred and seven.

L. S.

T. H. Middleton,
Assistant-Secretary.

Notes on the Weather in November.

The unusually warm weather which prevailed in October throughout Great Britain was continued during the month of November in most places. During the *first* week, ending the 2nd November, the sky was generally cloudy and the conditions unsettled. The warmth was "moderate" throughout, except in England N.E., where it was "unusual." Sunshine was, however, "scanty" everywhere, except in England N.W., where it reached "moderate." Rainfall was very uneven, being "light" in England E., and "heavy" in the Midlands. It was also "heavy" in England S.W. Elsewhere it was moderate. Several frosts were registered on the grass. During the *second* week a period of anticyclonic conditions set in and the weather was more settled, but mists and fogs prevailed. Except in Scotland W. and England S.W., where it was only "moderate," the warmth was everywhere "unusual" (England E., "very unusual.") Sunshine was, however, "scanty" nearly everywhere, while rainfall was "light" on the whole. The *third* week witnessed a continuance of the same kind of weather. It began with a dense fog over a large part of southern and south-eastern England, but later on it became fine and bright. The warmth remained "unusual" in most places (England E. and S., "moderate" only), while sunshine, except in the two first-mentioned districts, was "abundant," and in England N.E. and the Midlands "very abundant." Rainfall was "moderate" or "light" everywhere. The weather during the *fourth* week was very changeable at the beginning and also at the close, with a dense fog at other times. The warmth fell below the average everywhere in the western section of the United Kingdom, except England S.W., where in common with the rest of the country it was "moderate." In Scotland E., sunshine was "abundant," but in England E., N.E., S., and in the Midlands, it was "scanty." The rainfall was "heavy" only in England E., elsewhere it was "moderate." Until very nearly the close of the *fifth* week the weather was extremely unsettled with heavy falls of rain in nearly all parts of the country and snow in all the more northern and central parts. In the middle of the week thunder, sometimes accompanied with storms, was observed in many parts of England. Sunshine was, however, "abundant" throughout Great Britain, and in England N.E. and the Midlands it was "very abundant." Warmth was "deficient" in Scotland E. and W., England N.E. and N.W., "moderate" in the Midlands and England S.W., but "unusual" in England E. Rainfall throughout England was "heavy," in Scotland "moderate."

With this week the Autumn comes to an end. Great Britain enjoyed a much milder season than usual, and the number of weeks in which warmth was above the normal was very high. England N.E., saw no less than 9 weeks out of 13 of this nature, and 3 when the warmth fell below the average and 1 of normal temperature. England E. had 8 above, 5 normal and none below; the Midlands, 6 above, 6 normal and 1 below; England S., 7 above, 6 normal and none below; England N.W., 6 above, 4 normal and 3 below; England S.W., 4 above, 9 normal and none below; Scotland E. had 5 above, 6 normal and 2 below; Scotland W. had 6 above, 4 normal and 3 below. With respect to sunshine and rainfall the excesses in either direction were more evenly divided. But it is interesting to note that Scotland E had only 3 weeks when rainfall was more than normal, 4 of normal and 6 of deficiency, while Scotland W. had 2 weeks of excess to 5 of normal weather and 6 of deficiency. In the corresponding period of 1906 the weather, measured in this manner was far rainier.

Very few phenological observations have been received this month from the Board's correspondents. In nearly every district, however, it is stated that plants continued to grow till a very late period. In Berkshire the roots still kept growing and were reported an excellent crop. Wheat planting finished well, but clover seed suffered. Dahlias, fuchsias, roses, mignonette, Japanese pinks, sweetpeas, &c. reported as in full bloom at the beginning of the month, and dahlias remained abundant for some time afterwards, and out-door chrysanthemums were in abundance on the last day of the month.

Notes on Crop Prospects Abroad.

Germany.—According to the official report on the state of the crops in the middle of November, the condition of winter wheat may be expressed numerically as 2·4; of winter spelt as 2·3; and of winter rye as 2·3 (1 = very good, 2 = good, 3 = medium or average, 4 = small, 5 = very small). Generally the condition is considered to be very favourable.

Poland.—Mr. Consul General Murray, in a despatch dated 23rd November, states that August and September were very rainy months, and in consequence, rye and wheat were only got in with difficulty. A great deal of harm was done, but taking it all round the harvest in Poland was not so bad after all. Winter cereals were worse than those sown in spring, and winter wheat was especially bad in the Governments of Plock and Warsaw. In Lithuania, the weather was no more favourable for cereals than in Poland. The Government of Minsk suffered especially, and the harvest was a failure. In both Poland and Lithuania a great deal of harm was done to potatoes by the heavy and continuous rains at the end of the summer, especially in low lying ground. As potatoes are the staple food of the peasants, and a very important source of income to the landlords, who sell them to the spirit refineries and starch factories, the failure of this crop is very serious. The only English potatoes grown in Poland are the "Magnum Bonum" and the "Up-to-Date," but it is stated that their yield diminishes steadily year by year.

Trans-Caucasia.—The Board have received, through the Foreign Office, reports on agriculture of the Batoum Consular District by Mr. Consul Stevens and of the Novorossisk Consular District by Mr. Vice-Consul Geelmuyden. These are too long to be reproduced, but the originals can be inspected at the Offices of the Board.

Mr. Stevens states that the excessively dry spring of 1907, which was followed by a rainless spell during the early summer with only light occasional rainfalls while the cereal crops were in growth, resulted in the harvest season in the Trans-Caucasus being much postponed. Generally speaking, the production and yield is far below average in quantity and quality throughout almost all the provinces included in the district of this Consulate, and the situation thereby created for the population is most distressing. In many parts of the country, state aid will again have to be given to enable the peasant classes to tide over the winter, and seed for sowing purposes will have to be widely distributed to farmers.

Roumania.—In a despatch to the Foreign Office, dated 30th October last, Sir C. Greene states that the agricultural outlook in Roumania is very unsatisfactory. There has been a most severe drought, which has lasted in some districts for as much as six months, and has prevented any general attempt to begin the autumn sowings. The vast plains of Wallachia, which are, as a rule, an expanse of green, are absolutely brown and burnt to the consistency of brick. At the end of October, in some parts no attempt had been made to plough, and the appearance of the land showed that the soil must be baked hard for a considerable depth. Sir C. Greene adds that if rain does not very soon fall, the whole of next year's spring crops will be a failure.

Bulgaria.—H.M. Vice-Consul at Sofia (Mr. G. O'B. Toulmin) reports with regard to the agricultural outlook in Bulgaria that a too severe winter, followed by a period of abnormal drought, caused the spring crops of 1907 to be a failure, with the exception of rye which was fairly good. Maize, plentifully sown to replace ploughed-up crops, has suffered from the excessive dryness of the summer and present autumn. For the same reason there will be a considerable shortage in the wheat crop, though the quality of the grain is said to be good. Forage is so scarce that it is doubtful whether the peasants will be able to keep sufficient cattle through the coming winter to do the spring ploughing; while, owing to the hard and dry state of the soil, no colza seed could be sown this autumn. The harvest of 1907, therefore, promises to be but a very moderate one, and will doubtless tend to diminish the import trade of the year. The French *Journal Officiel* (11th November, 1907), states that the yield of wheat has been officially estimated at 37,100,000 bushels.

Norway.—H.M. Consul at Christiania reports (16th November) that the corn crops owing to the incessant rains have suffered greatly. The output is now stated to be far below the average, and the import is likely to increase materially. Potatoes are below the average all over the country, and the quality is inferior owing to the heavy rains.

Argentina.—According to *Dornbusch* (20th November, 1907), the final estimate of the Minister of Agriculture for 1907–8 gives the area sown with wheat as 14,227,200 acres compared with 14,059,240 in 1906–7; the area of oats is put at 701,480 acres against 395,200, and of linseed at 3,435,770 acres against 3,087,000 acres.

The Board have received, through the Foreign Office, a telegram dated 27th November, 1907, from Mr. Townley, H.M. Minister at Buenos Ayres, to the effect that recent statements which have appeared in the Press about damage to Argentine crops by locusts are unjustifiable. The wheat and linseed crops are considered to be quite safe, and are estimated to be the heaviest on record. Harvesting has already commenced in the northern districts. The maize crop is always more exposed to damage, and it is too soon to give an authoritative opinion about it, but experienced growers are confident that they can cope with the locusts which have appeared considerably later than usual this year. The crop is at present most promising owing to recent rains.

Canada.—An estimate of the crops in the Provinces of Manitoba, Saskatchewan and Alberta for 1907, made by the Canadian Pacific Railway, on the Government figures for area and the Grain Exchange figures for quantities, gives the wheat area as 5,010,352 acres and production 70,144,928 bushels compared with 94,461,000 bushels in 1906. The area under oats was 2,332,100 acres, and the estimated crop 89,955,960 bushels. The area under barley was 787,000, and the crop 22,036,000 bushels (*Dornbusch*, 9th November, 1907.)

Queensland.—Reporting under date of 12th October on the grain prospects in Queensland, the Board of Trade Correspondent at Brisbane (Mr. M. Finucan) states that dry weather had been prevailing throughout the southern parts of the State for the previous two months, which are the two most important months in the year as regards rainfall. There were exceptionally good falls of rain during the winter months, but the spring has been characterised by droughty conditions. The result will probably be that the whole of the cereal crops on the Darling Downs, the centre of the grain-producing area of Queensland, will be diminished by about one-half. Should the droughty conditions continue, it will undoubtedly be necessary to import maize, wheat, flour and barley; and this importation of food stuffs will be a matter of considerable importance. (*Board of Trade Journal*, 21st November, 1907.)

Warsaw Hop Fair.—Mr. Consul-General Murray, in reporting on the Hop Fair held at Warsaw in October, states that hops in Poland suffered much from bad weather in the spring of 1907, but that the yield was a good deal better than had been expected. It was, however, considerably short of that of last year, which, in its turn, had been about 20 per cent. short of an average crop. The yield this year in Poland is estimated to be about 10,000 cwts., the quality of the hops being generally very good. Throughout the year business in hops had been dull, and less than 300 cwts. of last year's hops remained unsold. The demand at the Fair was, therefore, very brisk, especially for the better qualities. The amount of hops put on sale at the Fair was 4,617 cwts., which was about 500 cwts. less than last year. Practically all were sold at about the same prices as last year.

Hop Crop in Germany.—According to a return published in the *Reichsanzeiger* (11th November, 1907), the area devoted to the hop crop in Germany in 1907 was 36,022 hectares, and the estimated yield 227,274 metric centners as compared with 198,257 metric centners last year. Bavaria is the largest contributor to this total, 129,389 metric centners coming from that country; of these, 38,743 metric centners were classified as "very good," 56,631 metric centners as "good," and 31,592 metric centners as "medium," the remainder being below that standard.

Miscellaneous Notes.

Destruction of Charlock by Lime Nitrogen.—According to some experiments in Germany, lime nitrogen (calcium cyananide) has proved a means of destroying charlock. In one case ½ cwt. of lime nitrogen was dissolved in about 90 gallons of water per acre and the crop (a mixture of peas, vetches and barley) sprayed. In another case the fertiliser was applied to the land at the rate of about 60 lb. per acre, with the result that most of the charlock was killed, and a very luxuriant crop of oats produced. Similar results were obtained with peas. It is thought, however, to be a question whether the result would have been satisfactory if rain had not fallen shortly after the manure was applied, owing to the possibility of injury to the oats. (*Mitt. der deutschen Land-Gesell.*, 20th July, 1907.)

Potato Drying in Germany.—The method of potato drying in Germany which was described in this *Journal* (September, 1906) as a new means of utilising the surplus potato crop appears to have been largely adopted in that country, and it is claimed that the dried potatoes form an excellent feeding material for cattle, cows and pigs, which may be used as a partial substitute for maize. According to a communication issued by the German Potato Dryers' Union, it is also suitable for feeding horses as a substitute for oats, and has been successfully used for the purpose by a number of farmers. (*Zeit. für Spiritusindustrie*, 12th September, 1907.)

Prevention of the Cabbage Flea.—Reference has been made in this *Journal* (August, 1905) to experiments carried out in Germany for the purpose of testing measures recommended for the prevention of the Cabbage Flea (*Haltica Oleracea*). Among them, dusting the plants with tobacco dust is mentioned as satisfactory. During the present year this pest has been very troublesome in Germany, and this remedy has given excellent results on a large area of white cabbage, to which it was applied at the rate of rather less than 3 cwt. per acre. Four days after the application none of the insects could be found, nor did they appear again subsequently. It is mentioned that successful results can only be expected in dry weather, as rain would wash the tobacco dust into the ground. (*Frak. Blätter für Pflanzenbau*, June, 1907.)

Agricultural Scholarships in Ireland.—The Department of Agriculture and Technical Instruction for Ireland offer Scholarships in Agriculture, Horticulture and Forestry, tenable at the Albert Agricultural College, Glasnevin. Each Scholarship entitles the holder to (1) free admission to the first year's course of instruction at the College; (2) third-class railway fare for one journey to and from the College in each Session; and (3) either of the following at the option of the Department:—(a) a maintenance allowance of one guinea per week while in attendance at the College; or (b) free board and residence at the Albert Agricultural College, Glasnevin, Dublin, together with a small grant towards the cost of books and apparatus.

A Scholarship is tenable for one year, but, if satisfactory progress is made by the holder, it will be renewed for a second and even for a third year to enable the student to complete the course at the College.

These Scholarships are intended to afford the sons of Irish farmers an opportunity of training for posts as County Instructors or Teachers under the Department's Programme, and special importance is attached to proficiency in practical work, which is the chief subject of the examination.

The Agricultural Faculty at the Royal College of Science was established by the Department in 1900. Since then there has been an increasing demand for these scholarships. Already forty-three young Irishmen, who have held scholarships and passed successfully through their course at the College have received appointments as County Instructors, Teachers, etc.

Conditions of Employment of Gardeners at Kew.—Applicants for admission as gardeners into the Royal Botanic Gardens, Kew, must be unmarried, between 19 and 24 years of age, and must have been employed not less than four years in good gardens or nurseries. They must be healthy, free from physical defect, and not below average height.

Applicants selected for appointment who are British subjects, will, if they render approved service, be eligible to remain at Kew for a period of two years from date of joining. Foreigners selected for appointment will be eligible to remain at Kew for a period of twelve months only. At the termination of two years' experience in the Royal Botanic Gardens, a gardener will cease to be employed at Kew unless he has in the meantime been selected for service as a sub-foreman for a further definite period of strictly limited duration.

Courses of instruction in subjects underlying or related to horticulture, which are arranged in a curriculum extending over two years, are provided free of charge for the temporary gardening staff of the Royal Botanic Gardens. These subjects are, as far as possible, taught practically, and every gardener who, before entering Kew, has not attended a corresponding course of instruction for which he holds a certificate granted by the Board of Education, must attend each course. Any gardener who fails to show satisfactory progress or who fails to render approved service may be discharged. Members of the temporary gardening staff are required to vacate their appointment if they marry.

Gardeners while at Kew receive an allowance of twenty-one shillings per week to meet the cost of subsistence. Those who are selected to serve as sub-foremen receive twenty-seven shillings per week.

A copy of the memorandum of conditions and a form of application can be obtained on application.

Importation of Poultry into South Australia.—By a Proclamation dated 16th January, 1907, poultry have been brought under the provisions of the Stock Diseases Act of South Australia, and another Proclamation dated 11th February, 1907, promulgated regulations for the restricted introduction of poultry into South Australia. A copy of the Proclamations may be consulted by persons interested at the offices of the Board of Agriculture and Fisheries, 4, Whitehall Place, S.W. The import regulations as regards horses, cattle, sheep and pigs were given in this *Journal* for July, 1905.

International Exhibition at Toulouse.—An international exhibition will be held at Toulouse from May to September, 1908. All branches of agriculture (other than live stock), dairying, horticulture and forestry will be represented. The charge for space in the buildings provided is fixed at 40 frs. the square mètre, but for machinery and agricultural implements this is reduced to 25 frs. per square mètre. Space to erect buildings can be obtained at 10 frs. the mètre. A copy of the programme can be seen at the offices of the Board.

SELECTED CONTENTS OF PERIODICALS.

Journal of the Royal Statistical Society. LXX.

Pt. I. Correlation of Weather and Crops, *R. H. Hooker;* Pt. II. The Decline in Number of Agricultural Labourers in Great Britain, *Lord Eversley;* Pt. III. Some Considerations relating to the Position of the Small Holding in the United Kingdom, *W. G. S. Adams.*

Journal of the Department of Agriculture and Technical Instruction for Ireland. VIII. I.

Early Potato Growing; Home Bottling of Fruit; Poultry Fattening; Cultivation of Flax in Belgium and Holland; Advantage of Early Ploughing; Position of Larch in Irish Forestry; Irish Fruit Crop Statistics.

Bulletin Mensuel de l'Office de Renseignements Agricoles. 16. 10.

Note sur les pommes de terre fileuses, *F. Parisot.*

Naturwissenschaftliche Zeitschrift für Land- und Forstwirtschaft. 5. 11.

Dasyneura fraxinea nov. spec., *J. J. Kieffer;* Dasyneura fraxinea Kieff, ein neuer Schädling der Esche, *W. Baer:* Die Blaufäule des Nadelholzes, *E. Münch.*

ADDITIONS TO THE LIBRARY.

[NOTE.—The receipt of *annual* publications of foreign agricultural and other departments, experiment stations and societies is not noted in the monthly list of additions to the Library, but a list of all such publications, which are regularly received, will be given from time to time.]

Austria Hungary—

K. K. Ackerbau-Ministerium. Die Wildbachverbauung in Österreich. (24 pp.) Wien, 1907.

Belgium.

Collett, Octave, J.-A.—Le Tabac. (282 pp.) Brussels: Falk, 1903.

Canada—

Shaw, T. Weeds, and how to eradicate them. (208 pp.) Toronto, 1893.

Department of Agriculture for Canada.—Farm Weeds of Canada. (56 plates). 1906.

France—

Laurent, L.—Le Tabac, sa culture et sa préparation. (337 pp.) Paris: Challamel, 1901. Congrès des Caisses de Crédit Agricole Mutuel tenus à Montpellier, Janvier, 1904. (278 pp.) Montpellier: Coulet, 1904. L'École Nationale d'Agriculture de Montpellier. (260 pp.) Montpellier: Coulet, 1900. 8 fr.

Houdaille, F.—Le Soleil et l'Agriculteur. (542 pp.) Paris: Masson, 1893.

Roux, J.-A. Cl.—Traité des Rapports des Plantes avec le Sol et de la Chlorose Végétale. (469 pp.) Paris: Masson, 1900. 15 fr.

Coulet, É.—Le Mouvement Syndical et Coopératif dans l'Agriculture française. (230 pp.) Paris: Masson, 1898. 5 fr.

Germany—

Deutsche Landwirtschafts-Gesellschaft.—Arbeiten, Heft, 129. Versuche über die Stickstoffdüngung der Kulturpflanzen. (288 pp.) Berlin: Paul Parey, 1907.

Great Britain—

Cassell's Dictionary of Practical Gardening, edited by Walter P. Wright. 2 vols. (480 + 480 pp.) London: Cassell & Co.

Wright, W. P.—Pictorial Practical Fruit Growing. (152 pp.) London: Cassell & Co., 1907. 1s. 6d. net.

Colonial Reports.—Report upon the Caicos Islands: with special reference to the further development of the Sisal Industry. [Cd. 3766.] (29 pp.) London: Wymans, 1907. 2d.

Bedford C. C.—Report upon the Wheat Plots, 1907. (3 pp.)

Leeds University.—Bull. 69. Report on a test of Varieties of Wheat, with notes on the weather, 1907. (13 pp.) Leeds, 1907.

Massee, G.—British Fungus Flora. 4 vols. (432 + 460 + 512 + 522 pp.) London: George Bell, 1892-1895.

Royal Commission on Tuberculosis (Human and Animal).—2nd Interim Report. Part II. Appendix.—Vol. II. The Pathogenic Effects of Human Viruses, by Dr. L. Cobbett. In two parts. [Cd. 3660 and 3661.] (1-616 pp. and 617-1217 pp.) 6s. 6d. each. Vol. III. Additional Investigations of Bovine and Human Viruses. [Cd. 3758]. (261 pp.) London: 2s. 10d. Wyman, 1907.

Cooke, M. C.—Illustrations of British Fungi. 8 Vols. (1,196 plates). London: Williams and Norgate, 1889-91.

Lehlich, W. and Pearson, R. S.—Working Plan for the Ardross Woods. (52 pp.) London: Bradbury, Agnew, 1907.

Gordon, W. J.—Manual of British Grasses. (180 pp.) London: Simpkin, Marshall.

[Books may be borrowed from the Board's Library on certain conditions, which may be ascertained on application.]

PRICES OF AGRICULTURAL PRODUCE.

AVERAGE PRICES of LIVE STOCK in ENGLAND and SCOTLAND in the Month of November, 1907.

(Compiled from Reports received from the Board's Market Reporters.)

Description.	England.		Scotland.	
	First Quality.	Second Quality.	First Quality.	Second Quality.
FAT STOCK :—	per stone.*	per stone.*	per cwt.†	per cwt.†
Cattle :—	s. d.	s. d.	s. d.	s. d.
Polled Scots	7 6	7 4	38 4	34 4
Herefords	7 10	7 4	—	—
Shorthorns	7 7	6 11	37 0	33 6
Devons	8 0	7 4	—	—
	per lb.*	per lb.*	per lb.*	per lb.*
	d.	d.	d.	d.
Veal Calves	$7\frac{3}{4}$	7	$8\frac{1}{4}$	$6\frac{1}{4}$
Sheep :—				
Downs	9	$8\frac{1}{4}$	—	—
Longwools	$8\frac{1}{2}$	$7\frac{3}{4}$	—	—
Cheviots	9	$8\frac{3}{4}$	9	8
Blackfaced	$8\frac{1}{2}$	8	$8\frac{1}{2}$	$7\frac{1}{4}$
Cross-breds	9	$8\frac{1}{4}$	9	8
	per stone.*	per stone.*	per stone.*	per stone.*
Pigs :—	s. d.	s. d.	s. d.	s. d.
Bacon Pigs	6 4	5 11	6 0	5 5
Porkers	6 11	6 6	6 5	5 10
LEAN STOCK :—	per head.	per head.	per head.	per head.
Milking Cows :—	£ s.	£ s.	£ s.	£ s.
Shorthorns—In Milk	22 2	18 13	23 1	18 4
,, —Calvers ...	21 19	18 5	20 7	17 3
Other Breeds—In Milk ..	20 7	16 2	19 11	16 1
,, —Calvers ...	15 0	13 10	19 17	16 2
Calves for Rearing	2 1	1 13	1 17	1 8
Store Cattle :—				
Shorthorns—Yearlings ...	9 17	8 3	9 18	8 3
,, —Two-year-olds ...	14 4	12 11	14 7	11 18
,, —Three-year-olds	16 5	14 18	15 17	13 10
Polled Scots—Two-year-olds	—	—	14 11	12 12
Herefords— ,,	14 15	13 3	—	—
Devons— ,,	14 5	11 19	—	—
Store Sheep :—	s. d.	s. d.	s. d.	s. d.
Hoggs, Hoggets, Tegs, and Lambs—				
Downs or Longwools ...	43 4	37 5	—	—
Scotch Cross-breds... ...	—	—	31 6	24 9
Store Pigs :—				
Under 4 months	23 6	16 1	17 4	14 2

* Estimated carcase weight.

† Live weight.

AVERAGE PRICES of DEAD MEAT at certain MARKETS in ENGLAND and SCOTLAND in the Month of November, 1907.

(Compiled from Reports received from the Board's Market Reporters.)

Description.	Quality.	London.	Birmingham.	Manchester.	Liverpool.	Glasgow.	Edinburgh.
		per cwt. s. d.	per cwt. s. d.	per cwt. s. d.	per cwt. s. d.	per cwt. s. d.	per cwt. s. d.
BEEF :—							
English	1st	51 6	48 0	47 0	46 6	56 6*	51 0*
	2nd	49 6	43 0	42 6	43 0	54 6*	45 0*
Cow and Bull ...	1st	35 6	41 0	40 0	37 6	44 6	39 6
	2nd	25 6	36 0	35 6	33 0	37 6	35 6
U.S.A. and Canadian :—							
Port Killed ...	1st	52 0	46 6	—	46 6	50 0	—
	2nd	47 6	40 0	42 0	42 6	46 6	—
Argentine Frozen—							
Hind Quarters ...	1st	32 0	32 6	32 0	32 0	35 0	33 0
Fore ,, ...	1st	23 6	26 0	24 6	24 6	25 6	26 0
Argentine Chilled—							
Hind Quarters ...	1st	43 6	43 6	39 6	39 0	—	43 6
Fore ,, ...	1st	26 6	28 6	29 0	31 6	—	31 6
American Chilled—							
Hind Quarters ...	1st	59 6	57 0	57 0	56 6	58 6	58 0
Fore ,, ...	1st	36 0	37 0	36 6	36 0	38 6	38 6
VEAL :—							
British	1st	65 6	61 0	65 6	70 6	—	—
	2nd	60 6	49 0	58 6	64 0	—	—
Foreign	1st	67 6	—	—	—	—	65 6
MUTTON :—							
Scotch	1st	71 6	68 0	71 6	71 0	71 6	66 0
	2nd	66 0	51 6	66 6	66 0	60 6	53 6
English	1st	65 6	70 0	67 6	65 6	—	—
	2nd	60 0	51 6	63 0	60 6	—	—
U.S.A. and Canadian—							
Port killed ...	1st	—	65 6	—	—	—	—
Argentine Frozen ...	1st	31 0	30 6	30 6	30 6	31 0	31 0
Australian ,, ...	1st	28 0	30 0	28 0	28 0	31 0	—
New Zealand ,, ...	1st	38 6	—	—	42 0	—	—
LAMB :—							
British	1st	—	68 6	—	—	70 0	—
	2nd	—	64 0	—	—	65 4	—
New Zealand ...	1st	51 6	54 0	51 6	51 6	48 6	—
Australian	1st	46 6	48 6	46 0	46 0	—	—
Argentine	1st	44 6	46 6	—	—	—	—
PORK :—							
British	1st	58 6	62 0	64 6	63 6	56 0	50 0
	2nd	49 0	55 0	59 6	60 0	53 6	42 6
Foreign	1st	54 0	69 0	67 6	68 0	—	—

* Scotch.

AVERAGE PRICES of **British Corn** per Quarter of 8 Imperial Bushels, computed from the Returns received under the Corn Returns Act, 1882, in each Week in 1905, 1906 and 1907.

Weeks ended (*in* 1907).	Wheat.			Barley.			Oats.		
	1905.	1906.	1907.	1905.	1906.	1907.	1905.	1906.	1907.
	s. d.	*s. d.*	*s. d.*	*s. d.*	*s. d.*	*s. d.*	*s. d.*	*s. d.*	*s. d.*
Jan. 5 ...	30 4	28 4	26 0	24 4	24 6	23 11	16 3	18 2	17 3
,, 12 ...	30 4	28 6	26 1	24 6	24 8	24 2	16 3	18 4	17 4
,, 19 ...	30 5	28 5	26 1	25 0	24 11	24 1	16 5	18 4	17 5
,, 26 ...	30 6	28 7	26 2	25 1	25 1	24 5	16 7	18 7	17 5
Feb. 2 ...	30 6	28 10	26 3	25 0	25 1	24 4	16 7	18 10	17 5
,, 9 ...	30 7	28 10	26 6	25 2	25 3	24 5	16 8	18 10	17 7
,, 16 ...	30 5	28 11	26 7	25 2	25 6	24 1	16 9	19 0	17 7
,, 23 ...	30 10	28 10	26 10	25 0	25 4	24 2	16 10	19 0	17 9
Mar. 2 ...	30 8	28 8	26 9	25 2	25 0	24 2	16 10	19 0	17 9
,, 9 ...	30 9	28 5	26 8	25 2	25 1	23 11	16 10	18 8	17 11
,, 16 ...	30 10	28 5	26 10	24 11	24 8	24 2	16 10	18 10	18 0
,, 23 ...	30 9	28 4	26 10	25 2	24 4	24 0	17 0	18 8	18 1
,, 30 ...	30 9	28 3	26 8	25 1	24 5	23 9	16 11	18 11	18 2
Apl. 6 ...	30 9	28 7	26 9	25 6	24 2	24 3	17 0	18 11	18 3
,, 13 ...	30 8	28 11	26 8	24 3	24 4	23 9	17 6	19 4	18 6
,, 20 ...	30 8	29 4	26 8	24 4	24 0	23 3	17 5	19 1	18 7
,, 27 ...	30 9	29 6	26 10	24 4	24 0	23 3	17 9	19 6	18 9
May 4 ...	30 8	29 10	27 0	25 3	23 10	23 6	18 0	19 9	19 3
,, 11 ...	30 8	30 1	27 6	24 10	24 1	24 0	18 3	20 0	19 7
,, 18 ...	30 10	30 3	28 4	24 8	23 10	23 10	18 5	20 1	20 1
,, 25 ...	30 11	30 4	29 7	24 4	24 2	24 3	18 8	20 2	20 5
June 1 ...	31 3	30 4	31 4	23 6	22 10	24 0	19 1	20 5	20 8
,, 8 ...	31 4	30 3	32 0	24 0	23 4	24 7	18 11	19 11	20 7
,, 15 ...	31 7	30 4	31 10	26 0	23 6	24 7	19 1	20 2	20 11
,, 22 ...	31 7	30 5	31 4	23 9	22 10	24 11	18 10	20 2	20 9
,, 29 ...	31 8	30 3	31 2	23 2	24 3	24 6	19 7	20 1	20 8
July 6 ...	32 1	30 2	31 3	22 11	23 0	24 8	19 6	20 2	20 11
,, 13 ...	32 3	30 5	32 0	23 10	23 8	24 10	19 7	20 4	20 11
,, 20 ...	32 2	30 3	32 6	23 7	23 2	24 6	18 11	20 5	21 1
,, 27 ...	32 3	30 5	32 11	23 11	22 4	27 3	19 3	20 2	20 8
Aug. 3 ...	31 11	30 9	33 2	22 0	22 1	26 4	18 4	19 3	21 2
,, 10 ...	30 5	30 5	33 5	22 5	23 0	26 6	16 11	17 11	21 3
,, 17 ...	28 5	29 0	33 6	23 4	24 2	25 9	16 4	17 0	20 4
,, 24 ...	27 1	27 9	33 7	23 6	25 0	25 0	15 9	16 10	19 8
,, 31 ...	26 11	26 9	33 10	23 5	24 3	24 6	15 9	16 6	18 11
Sept. 7 ...	27 1	26 4	31 11	23 4	24 9	24 2	15 11	16 3	17 7
,, 14 ...	26 11	25 11	31 4	23 7	24 3	24 4	16 0	16 1	17 6
,, 21 ...	26 8	25 9	31 5	23 10	24 3	25 0	15 11	16 0	17 6
,, 28 ...	26 9	25 9	31 8	24 3	24 8	25 3	16 1	16 2	17 8
Oct. 5 ...	26 9	26 1	32 6	24 9	25 0	25 5	16 3	16 3	17 9
,, 12 ...	26 11	26 3	33 3	24 10	25 3	25 9	16 6	16 7	17 11
,, 19 ...	27 1	26 6	34 4	25 0	24 10	26 3	16 7	16 8	18 0
,, 26 ...	27 4	26 7	35 9	24 11	24 10	27 2	16 8	16 10	18 7
Nov. 2 ...	27 10	26 7	36 3	24 9	24 8	27 7	17 1	16 11	18 10
,, 9 ...	28 3	26 6	35 10	24 10	24 8	27 8	17 4	17 1	18 10
,, 16 ...	28 7	26 4	35 1	24 6	24 4	27 8	17 8	17 2	18 8
,, 23 ...	28 5	26 3	34 7	24 6	24 1	27 5	17 9	17 3	18 9
,, 30 ...	28 8	26 1	34 7	24 6	24 1	27 5	17 11	17 2	18 7
Dec. 7 ...	28 6	26 1	34 7	24 7	24 1	27 1	17 11	17 4	18 6
,, 14 ...	28 5	26 1		24 5	23 11		17 11	17 3	
,, 21 ...	28 4	26 3		24 6	24 3		17 11	17 3	
,, 28 ...	28 3	26 0		24 7	24 1		18 1	17 3	

NOTE.—Returns of purchases by weight or weighed measure are converted to Imperial Bushels at the following rates: Wheat, 60 lbs.; Barley, 50 lbs.; Oats, 39 lbs. per Imperial Bushel.

AVERAGE PRICES of **Wheat, Barley,** and **Oats** per Imperial Quarter in FRANCE, BELGIUM, and GERMANY, and at PARIS, BERLIN, and BRESLAU.

—		Wheat.		Barley.		Oats.	
		1906.	1907.	1906.	1907.	1906.	1907.
		s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
France:	October ...	39 2	39 10	25 5	25 7	22 7	19 9
	November	39 6	40 2	26 1	25 11	22 11	20 1
Paris:	October ...	40 8	39 3	26 3	26 3	23 1	19 4
	November	40 4	38 5	26 7	26 2	23 5	19 0
Belgium:	July ...	29 8	35 4	23 11	25 5	22 7	24 0
	August ...	29 5	35 2	22 10	25 0	20 10	23 3
Germany:	October ...	38 11	49 8	30 5	32 11	22 4	24 10
	November	38 4	49 3	30 8	32 9	22 11	24 10
Berlin:	September	38 2	49 0	—	—	21 5	25 2
	October ...	38 6	49 10	—	—	22 4	24 7
Breslau:	September	36 10	47 5	28 8 (brewing) 23 3 (other)	30 1 (brewing) 27 0 (other)	24 1	25 0
	October ...	37 11	48 6	28 8 (brewing) 23 3 (other)	32 1 (brewing) 27 2 (other)	20 8	22 7

NOTE.—The prices of grain in France have been compiled from the official weekly averages published in the *Journal d'Agriculture Pratique*; the Belgian quotations are the official monthly averages published in the *Moniteur Belge*; the German quotations are taken from the *Deutscher Reichsanzeiger*, the prices for the German Empire representing the average of the prices at a number of markets.

AVERAGE PRICES of **British Wheat, Barley,** and **Oats** at certain Markets during the Month of November, 1906 and 1907.

—	Wheat.		Barley.		Oats.	
	1906.	1907.	1906.	1907.	1906.	1907.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
London...	27 6	36 6	25 1	28 7	18 0	19 7
Norwich	26 5	34 10	24 7	27 5	16 9	18 6
Peterborough	25 4	34 9	23 8	27 2	16 6	18 3
Lincoln...	25 8	34 9	23 11	27 6	16 9	18 6
Doncaster	25 8	34 7	23 9	27 7	16 9	18 8
Salisbury	26 8	35 6	24 5	27 8	17 4	18 10

AVERAGE PRICES of PROVISIONS, POTATOES, and HAY at certain MARKETS in ENGLAND and SCOTLAND in the Month of November, 1907.

(Compiled from Reports received from the Board's Market Reporters.)

Description.	London.		Bristol.		Liverpool.		Glasgow.	
	First Quality.	Second Quality.	First Quality.	Second Quality.	First Quality.	Second Quality.	First Quality.	Second Quality.
	s. d.	*s. d.*	*s. d.*	*s. d.*	*s. d.*	*s. d.*	*s. d.*	*s. d.*
BUTTER :—	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.
British ...	16 0	14 0	15 0	14 0	—	—	15 6	—
	per cwt.	per cwt.	per cwt.	per cwt.	per cwt.	per cwt.	per cwt.	per cwt.
Irish Creamery	120 6	118 0	124 6	120 6	121 0	119 0	120 0	—
,, Factory	100 0	91 0	98 0	94 6	104 6	95 6	—	—
Danish ...	125 6	123 6	—	—	126 6	123 6	125 6	—
Russian ...	113 0	109 0	111 0	102 0	108 0	96 6	110 6	101 0
Australian ...	120 6	118 6	119 6	113 6	119 6	117 6	120 0	—
New Zealand	121 0	119 0	115 6	112 0	123 6	121 6	—	—
CHEESE :—								
British—								
Cheddar ...	73 6	69 6	72 0	64 0	74 0	70 0	66 0	63 0
					120 lb.	120 lb.		
Cheshire ...	—	—	—	—	75 0	70 0	—	—
					per cwt.	per cwt.		
Canadian ...	63 6	62 6	63 0	60 0	62 6	59 6	63 0	60 0
BACON :—								
Irish	59 6	57 0	—	—	60 0	57 6	63 0	59 0
Canadian ...	55 0	53 0	59 0	56 0	55 6	54 0	57 0	54 6
HAMS :—								
Cumberland ...	112 0	101 6	—	—	—	—	—	—
Irish	101 6	90 0	—	—	—	—	88 0	78 0
American (long cut) ...	60 6	58 0	57 0	53 0	56 6	50 6	54 6	51 6
EGGS :—	per 120.	per 120.	per 120.	per 120.	per 120.	per 120.	per 120.	per 120.
British ...	20 0	17 11	17 8	—	—	—	—	—
Irish	17 0	14 1	14 1	12 1	14 1	12 6	13 10	11 6
Danish ...	14 8	13 5	14 1	12 7	14 0	12 4	13 0	10 7
POTATOES :—	per ton.	per ton.	per ton.	per ton.	per ton.	per ton.	per ton.	per ton.
Langworthy ...	110 0	100 0	105 0	90 0	105 0	100 0	91 0	86 0
Main Crop ...	107 6	98 6	100 0	90 0	105 0	100 0	90 0	85 0
Up-to-Date ...	97 6	83 6	95 0	85 0	81 6	76 6	90 0	85 0
HAY :—								
Clover ...	100 0	89 0	82 6	80 0	100 0	70 0	83 6	77 6
Meadow ...	91 0	80 0	73 0	70 0	—	—	83 6	77 6

DISEASES OF ANIMALS ACTS, 1894 to 1903.

NUMBER of OUTBREAKS, and of ANIMALS Attacked or Slaughtered.

GREAT BRITAIN.

(From the Returns of the Board of Agriculture and Fisheries.)

DISEASE.	NOVEMBER.		11 MONTHS ENDED NOVEMBER.	
	1907.	1906.	1907.	1906.
Swine-Fever :—				
Outbreaks	151	169	2,229	1,128
Swine Slaughtered as diseased or exposed to infection ...	795	1,024	10,684	6,517
Anthrax :—				
Outbreaks	92	108	995	861
Animals attacked ...	121	135	1,340	1,214
Glanders (including Farcy) :—				
Outbreaks	69	95	787	1,012
Animals attacked	146	174	1,791	1,915
Sheep-Scab :—				
Outbreaks	98	94	541	425

IRELAND.

(From the Returns of the Department of Agriculture and Technical Instruction for Ireland.)

DISEASE.	NOVEMBER.		11 MONTHS ENDED NOVEMBER.	
	1907.	1906.	1907.	1906.
Swine-Fever :—				
Outbreaks	9	7	144	91
Swine Slaughtered as diseased or exposed to infection ...	257	35	2,632	983
Anthrax :—				
Outbreaks	—	1	3	4
Animals attacked	—	1	5	8
Glanders (including Farcy) :—				
Outbreaks	—	—	5	8
Animals attacked	1	—	10	16
Sheep-Scab :—				
Outbreaks	35	36	241	221

(5,000 12 | 07—H & S 2579)

THE JOURNAL

OF THE

BOARD OF AGRICULTURE.

Vol. XIV. No. 10.

JANUARY, 1908.

CIDER ORCHARDS.

B. T. P. BARKER, M.A.

Director of the National Fruit and Cider Institute.

There is one aspect of the cider industry to which comparatively little attention has been paid, notwithstanding the general revival of interest in cider making and the scientific study of its problems. While attention has been fixed upon the fruit, the most profitable methods of extracting the juice, and the most satisfactory modes of dealing with it during the course of fermentation, the orchard side of the question—which is equally important—has been somewhat neglected. There appear to be no generally accepted ideas as to the principles which should be observed in planting orchards for vintage purposes; and, as a result, many of those which are being planted are stocked with varieties reputed to be useful for cider purposes, and of vigorous growth, without any regard being paid to the question of suitable proportions of each kind and similar points of importance from the vintage point of view.

Necessity for planting fresh orchards.—It is certain that the future welfare of the industry depends mainly upon a largely increased planting of fresh orchards during the course of the next few years. Probably the large majority of the existing orchards have long passed their best days and are now dying out; and few are being planted to fill their places. In unfavourable seasons the supply of fruit is so small, compared with the demand, that the high prices fetched by it make it practically impossible for the buyer to convert it

into *pure* cider at a reasonable profit. Before many years, if the present state of affairs is allowed to continue, there will be a regular and more serious shortage of cider fruit; this means that not only will any extension of the industry be impossible, but a decline from its present position will be inevitable. The matter is so serious, that it cannot be too forcibly impressed upon those interested in the industry that fresh orchards must be planted, if a suitable supply of fruit is to be maintained. The number of young orchards is small; and enquiries among leading nurserymen, who propagate cider varieties, show that the demand for young trees is still limited. It is indeed stated that in many nurseries, where formerly cider trees were extensively raised, their propagation has been given up in consequence of the lack of demand.

An equally serious point, as far as the general welfare of the industry is concerned, is that the maintenance of a standard of purity of the beverage is intimately connected with the question of an abundant supply of fruit.

Characteristics of a cider orchard.—Since it is of importance that fresh orchards should be planted, and since there are indications in some quarters that the need is beginning to be recognized, it may be opportune to consider what the essential characteristics of a good cider orchard should be from the cider-makers' point of view. The general arrangement and the selection of varieties for a vintage orchard are matters which involve questions of some complexity, quite distinct from those met with in connection with the laying out of orchards for market purposes. The questions are for the most part unique in character, since they present in many ways features of a materially different nature from those occurring in connection with the laying out of vintage vineyards, the example which offers probably the nearest parallel. It must be borne in mind that the value of an orchard for vintage purposes is determined by the quality of the cider which can be made from its produce; and it may be shown that this is determined primarily by the kinds of fruit and the relative proportions of the three main types of cider fruit, viz., sharp, sweet, and bitter-sweet apples.

The ideas as to the construction of a cider orchard, which are here put forward, have been based to some extent upon the general experience of cider-fruit growers, and are supported

by the results of experimental work, which has been carried on at the National Fruit and Cider Institute.

Selection of a site.—With regard to the selection of a site an important point to be remembered is that, the more the fruit is exposed to the sun, the better, *cœteris paribus*, is the quality of the cider. Consequently the situation should be such that the trees can catch the maximum amount of direct sunlight. A slope facing southwards is perhaps best. The question of soil is one that has not yet been exhaustively dealt with experimentally. Cider-makers with extensive experience agree that the best and most full-bodied ciders are made from fruit grown on a heavy soil, especially clay.

Methods of planting.—Details as to the methods of planting, the distance of the trees from one another, and their general treatment do not differ materially from those suitable for apple orchards in general. It is, however, customary in the west of England to allow cider orchards to become grassed over, even if, as is the rule, they are not originally started on grass land. The fruit, which is commonly gathered by being shaken off the trees on to the grass, can thus be obtained in a reasonably clean condition and free from adherent soil.

Arrangement according to varieties.—The special feature of a vintage orchard should lie in the selection and arrangement of the varieties of the fruit. It is in this direction that ordinary practice is most unsatisfactory. The large majority of the existing orchards are composed of a very large number of varieties, with but few trees—or sometimes one only—of a kind. No attention seems to have been paid to the proportions of the different types referred to above. Thus some orchards consist mainly of sharp fruit ; others of sweet or bitter-sweet sorts. Cider made from the produce of any one of such orchards may obviously be of inferior quality on account of the predominance of one or the other type. To obtain the best results, it is necessary to blend it with fruit of the types which are deficient obtained from other orchards ; or to utilise only a portion of the fruit of the predominating type. Other drawbacks of these miscellaneous orchards are, that all the varieties do not ripen at the same time, the fruit-gathering season in a single orchard thus being spread over probably the whole cider-making season from September to

December, and the orchard accordingly not being available for grazing purposes during that period ; that the tendency is, therefore, to gather varieties before they are properly ripened, in order to get the orchard cleared of fruit ; that in gathering, the task of keeping different varieties separate is difficult, if not impossible ; that there is not a sufficiently large quantity of any of the varieties to enable cider of a regular standard to be made ; and that the number of varieties utilised for cider purposes is so large, that it is impossible to become properly acquainted with the vintage qualities of more than a few sorts, and that therefore it renders control of the quality of the product practically impossible.

There are clearly then the following points regarding the general arrangement of the orchards which might with advantage be adopted :—

(*a*) The varieties having different ripening periods should be separated into distinct orchards. There should be at least three classes of orchards :—Early, containing varieties ripening from September to the end of October ; mid-season, containing varieties ripening from the end of October to the end of November ; and late, containing varieties ripening in December and later. The advantages of such a system are obvious.

(*b*) The number of different varieties should be restricted, and this should be followed by the propagation of a relatively large number of trees of the selected varieties. By this means only can the comparative uniformity of a maker's produce from season to season, which is so essential for commercial success, be attained ; and that control guaranteed, which is the outcome of a thorough knowledge of the qualities of the varieties in use.

(*c*) The varieties selected for any orchard should be chosen and planted in such proportions that the whole of the fruit grown in that orchard, if mixed together, would yield a good cider, that would not require blending. The object in view here is to make each vintage orchard self-contained for vintage purposes, and quite independent of other orchards. The advantage to the maker in such a case would be considerable. While the number of varieties, which it would be necessary to plant, depends upon the characters of those selected, it would probably be advisable in order that the total produce

might yield a satisfactory blend, not to plant more than three kinds, one a sharp, another a sweet, and the third a bitter-sweet variety. There is no necessity to increase the number; while if each of the three types just mentioned is represented, it is possible to obtain a cider of any desired standard of chemical composition by the adjustment of the proportions of the number of the trees of each kind. In many instances three varieties would not be necessary as there are several pairs of varieties which go well together, and do not, owing to their chemical composition, require a member of the third class to complete the blend. In certain cases only one variety need be planted, the juice in this instance having a suitable chemical composition without blending. As an example, the Kingston Black variety may be quoted. As a rule, however, a single variety has some element in its composition, either superabundant or deficient, and blending is therefore required to correct the proportion. But while these are the general lines upon which the selection and proportion of the varieties may be based, the matter will not be found so simple in practice. For instance, most cider varieties only bear full crops once in two years, and it does not follow that the bearing season for all the trees will be the same. The proportions of fruit of the different classes each season would thus be disturbed, possibly to a serious extent. Again, in scarce seasons, sharp and sweet cider varieties are usually sold largely for market purposes and for jam making, thus causing a preponderance of bitter-sweets for cider making. This, however, could not be avoided under any arrangement, and the simplest way out of this difficulty seems to be to reduce the planting of the bitter-sweet types to the lowest practicable proportions. Such an arrangement represents a considerable advance beyond the usual method; and whether or not the cider maker may eventually decide to make all varieties up separately, and to blend the juices or the ciders instead of the fruit, as at present practised, the fact that the produce, as a whole, of a single orchard could be relied upon approximately to yield a good cider, would facilitate matters considerably.

(*d*) Trees of the same variety should be planted in blocks or groups. Undoubtedly the most scientific method of dealing with fruit for vintage purposes is to have the different kinds

gathered and kept separately, so that the maker can either mix the fruit himself in the proportions which he desires, or can press each sort separately; and blend the liquor afterwards. With the existing miscellaneous collection of fruit this is impracticable on a large scale. By planting comparatively few varieties, but a large number of trees of each sort, and by grouping trees of one sort together, it will become perfectly practicable to deal with the fruit in this manner. What has been said in the previous paragraph, with regard to the relative proportions of trees of the different classes in a single orchard, is not rendered in any way unnecessary by the idea of keeping different sorts separate. These proportions are required eventually in the cider, although the maker may prefer for the time being, for the sake of working strictly to a definite standard of composition, to keep the varieties unmixed; and it is simpler to be able to rely upon each orchard as being complete in itself for vintage purposes, than to be obliged to adjust the proportions for blending by drawing upon the produce of other orchards. It is probably safer to recommend mixed orchards than to endeavour to arrive at the same end by advocating the planting of the same varieties in the same proportions in distinct orchards, each containing one variety only. There seems to be considerable reason for believing that some varieties, at any rate, fruit more abundantly if their blossom is cross-fertilized; and consequently it may be of importance that too large a number of trees of any one kind should not be planted in proximity.

Selection of varieties.—Passing on to the question of the varieties themselves, it follows from what has already been said that at least nine different sorts or types are required, viz. a "sharp," "sweet," and "bitter-sweet" for early, mid-season, and late orchards. To these might be added those varieties which yield a good cider without blending; but since they can be also included either among the "sweets" or the "medium sharps," it is hardly necessary to deal with them separately here.

In making a selection of the best varieties of each type, not only must the usual characters of growth, cropping qualities, resistance to disease, and so on, be taken into consideration, but there are also special characters of vintage

importance to be estimated. One of the most important of these is the characteristic flavour of the variety, a factor which is frequently sufficiently pronounced materially to affect the value of a cider. Two kinds of apples may have approximately the same chemical composition, and may yield the same type of cider, and yet the values of the two ciders may be widely different, owing solely to the difference in flavour of the two sorts. This feature is usually much more strongly marked in the case of sharp varieties than with other kinds.

Another most important factor is the rate of fermentation of the juice. Owing to a variety of causes this varies to some extent even with the same variety, but, generally speaking, the whole of the available evidence points to the conclusion that under normal conditions some varieties yield slowly fermenting juices, others give juice fermenting at a moderate rate, and others again produce juices capable of rapid fermentation. The general experience of cider-makers goes to show that members of the latter class are undesirable, since a dry cider only can be obtained from them by natural means. The flavour also is usually coarse. The other two classes are useful, the slowly-fermenting juices being naturally adapted for the production of sweet ciders, and those fermenting at a moderate rate being suitable for the preparation of dry, medium, or moderately sweet ciders.

Varieties which yield juices subject to an excessively slow fermentation should not be planted too extensively, since the ciders made from them are particularly liable to certain disorders, as, for example, cider sickness. However, if a supply of more rapidly fermenting juice is available for blending, such varieties may be utilised with safety. Unfortunately for the cider-maker there seems to be generally some connection between the rate of fermentation of the juice of a variety and the vigour of growth of the tree. Many of the strongest growing varieties, *e.g.*, Broadleaf and Morgan Sweet, yield excessively rapidly fermenting juices, *i.e.*, the lowest grade ciders; while weak-growing varieties, such as Kingston Black, give slowly fermenting juices and the best quality ciders. Possibly, when sufficient data are available, it may be found that the rate of fermentation of the juices varies directly as the vigour of growth of the tree. Further research, however,

is needed before this hypothesis can be considered to be proved.

Other important points in connection with the selection of varieties are, (a) the yield of juice which frequently varies by as much as 10 to 15 per cent. of the weight of the fruit in the case of different varieties ; (b) the degree of firmness of the flesh, hard-fleshed varieties being less easily bruised in gathering and handling than soft-fleshed kinds, and, therefore, less liable to decay and to the consequent taint in flavour, while they are more suited for storage when that is necessary.

In cases where it is proposed to plant a series of orchards, the idea of grouping the varieties, not only by their ripening periods, but also by their relative rates of fermentation would be worth consideration. Thus there might be orchards, the produce of which would yield either a sweet or a dry cider, whether consisting of early, mid-season or late varieties. Some arrangement of this nature would certainly tend to simplify matters for the cider-maker, and would probably add to the value of the orchards from the growers' point of view, since a definite idea of the quality of the produce of such orchards for cider-making purposes could be formed, and better prices for the fruit would be obtainable, just as at the present time better prices can be obtained for fruit of known value than for mixed fruit, about which little is known.

Varieties recommended.—Concerning individual varieties which can be recommended for propagation, any list which is given should be regarded as provisional only. The experimental work at the National Fruit and Cider Institute on the vintage qualities of different varieties of repute has shown that many kinds have been rated hitherto above their real value, and that there are in existence several comparatively or absolutely unknown sorts, which appear to be of superior quality, so far as can be judged from the limited experience of them, which it has been possible to gain since the commencement of the work three years ago. A very large number of varieties have been tested and the most promising kinds are being propagated at the Institute. Obviously, conclusive results cannot be arrived at in work of this character for several years, but meanwhile growers are anxious to have some guide as to the most suitable varieties

to plant. The following list has therefore been drawn up and contains representatives of each class required. It is not claimed that all of the varieties named are necessarily the best of the kind which are to be found, but every variety mentioned has been tested at the Institute, and is decidedly above the average of its class in quality. Undoubtedly in many instances superior varieties will be found after further research :—

VARIETIES recommended for Propagation.

—	Sharp Varieties.	Sweet Varieties.	Bitter-sweet Varieties.
Early ...	Backwell Red.	Belle Norman. Horners. White Jersey. (All mild bitter-sweets.)	Cherry Norman. Major. Knotted Kernel.
Mid-season	Cap of Liberty. Dufflin. Foxwhelp. Frederick. Kingston Black.	Sweet Alford. Woodbine.	Masters Jersey. Prince Albert. Strawberry Norman.
Late ...	Lambrook Pippin. Red Soldier. Yellow Styre.	Bell.	Chisel Jersey. Dabinet. Royal Jersey.

Many of these kinds are not at present obtainable from nurserymen; but all are being propagated at the Institute, and in due course the trees will be available for distribution. For the time being, the best plan for those who wish to grow them at once will be to graft such sorts on the heads of young standard trees of other varieties ; and it is probable that this method should be regularly adopted for weakly growing varieties, such as Kingston Black, a strong growing variety being selected for the standard.

Replanting old orchards.—Finally, the question of replanting in old orchards needs consideration. It is customary in many districts to fill up gaps in old orchards by planting young trees in the place of the old ones, which have died off. In some instances, when an old orchard is worn out, the trees are grubbed up and their places filled with young standards. The custom is one which cannot be recommended. In the first place, the young trees rarely, if ever, make such good growth, as they would if planted

in new land, even although all the old trees have been removed. Striking examples of this may be seen where two adjoining orchards of young trees have been planted at the same time, the one on new land and the other on the site of an old orchard. After a few years' growth the development of the trees in the latter case cannot be compared with that in the former. If this is so, where the old trees have been entirely removed, how much greater must be the prejudicial influence on growth in those instances, where a young tree is planted among old ones to fill a gap caused by the death of one of the latter. It is to be expected that the soil during the course of life of an orchard would become impoverished of the elements of food, which are needed for the growth of apple trees, and that a second orchard planted on the same site would suffer accordingly. There is, too, the possibility that the soil may become "apple-sick," as happens sometimes in the case of other crops.

A second, and most important, reason against the replanting of old orchards is the risk of infection of the young trees by insect and fungus pests. Most old orchards are hot-beds of pests of various descriptions, and although all old trees may be removed, the soil will certainly remain laden with the pests. Particularly dangerous are root fungi, such as Tree Root Rot (*Armillaria mellea*), also known as *Agaricus melleus*. This fungus spreads in the soil, and there does not appear to be any means of eradicating it. In most old orchards one can find trees attacked by it, and although it is possible that it may not be able to attack healthy unwounded roots, it can sooner or later find an entry into the tree through a damaged root, and eventually cause its death.

The whole question of the extension of orchard planting is thus reduced in the end to one of finding fresh land available for the purpose. The matter is one in which both landlord and tenant are concerned, and without entering here into a discussion of the points involved, the hope may be expressed that, in future, no obstacle to a satisfactory arrangement may arise, as it has done in the past, owing to inattention and want of care of the young trees after planting.

PIG FEEDING FOR THE DAIRY FARMER.

T. R. ROBINSON and C. W. WALKER-TISDALE.

The dairy farmer may advantageously dispose of his separated milk or whey by the feeding of pigs. In the making of cheese about 85 per cent. of the milk is returned to the farm in the form of whey, and in butter-making about 88 per cent. is separated milk. Taking an average of 484 gallons of returned milk valued at 1*d.* per gallon, then just over £2 per cow becomes chargeable to the pigs and poultry. This is inclusive of the butter milk that could also be used for feeding purposes. Having then a supply of by-products on hand, the points to consider are :—(1) Whether to buy or breed pigs; (2) whether the output shall be stores, London porkers, baconers, and, incidentally, sucking pigs where breeding is undertaken; (3) when is the best time to breed pigs; (4) how they can be fed most economically. With regard to the first of these questions, it is safer, owing to the possibility of introducing disease with bought pigs, to breed sufficient animals to consume the milk or whey. The selection of the breed is of primary importance, but whatever breed or cross may be chosen the sow should be of a quiet disposition, of a good breeding strain, and likely to throw and bring up large litters. To know that the animal is bred from one having these attributes is an advantage. The number of teats in a brood sow should not be less than ten or twelve, and the shape as well as the number should be carefully noticed. It must be remembered that the sow is a milking animal and that flat plate-shaped or blind teats are of little use. The brood sow should be long from throat to thigh, allowing plenty of room for the development of the pigs, and she should be capable of breeding strong, rapid-growing young. This condition rests mainly on her capacity for giving milk, and on her quality and cleanness of bone. A round-boned, coarse-jointed pig is one that is liable to cramp, and is not likely to produce strong, quick-growing litters. A good sow should also have a good width between the ears, the shape and carriage of which should be in accordance with the breed. Plenty of the right sort of fine hair generally denotes lean flesh. The shoulders should be light, as this part carries the cheaper quality of meat. Heaviness in the jowl indicates superabundance of fat.

The Time of Year for Breeding Pigs.—A gilt or young sow should not be less than twelve or fourteen months old before she pigs down, and April or May is a very suitable month for farrowing her first litter. The normal period of gestation is sixteen weeks or 112 days, and that is generally the time a *young* sow will carry her pigs. Older animals frequently go 117 days, and if about to produce small litters, gestation is longer than when a large litter is forthcoming. For older sows there are several reasons in favour of their breeding in January and July :—(1) Pigs bred in January may be fit for exhibition at the summer shows as breeding stock, and if well bred will sometimes realize high prices; the ages are calculated from January 1st, so they gain the full advantage of the classification; (2) weaning is better done gradually, that is, by not taking all the pigs away from the sow at one time; some of the young at three weeks old weighing about 9 or 10 lb. may be sold as sucking pigs; there is a trade for them during the winter months of the year; (3) the other pigs weaned at seven or eight weeks old can be fed on for a similar period to make small London porkers, weighing from 60 to 80 lb. at four months, or kept on to the autumn and sold as bacon hogs; (4) the sow has the very great benefit of getting plenty of exercise in a grass paddock or orchard from April to July; this is conducive to her becoming the mother of a strong litter; (5) in the case of July litters, the sow is under shelter during part of the hottest time of the year, but gets the advantage of going out to graze previously to visiting the boar, and she is thus kept very inexpensively throughout the late summer and autumn months; (6) during warm weather, the pigs grow fast.

Feeding Pigs.—Just how much food a pig consumes naturally depends on the size of the animal. It is often stated that one cow produces so much cheese or butter, in addition to fattening one pig, and something over to go towards keeping the breeding stock. Others say two cows to a pig when the whey alone is available. The more practical way is to estimate what weight of pork can be produced per cow from an average dairy, when butter is made, the separated milk being mixed with meal and converted into pork or bacon. The data required to answer this question are the weight at which it is proposed to sell the pigs, the average gain per day at various periods, the

amount of meal and milk it takes per day to produce 1 lb. of meat, and the yield of milk per cow. Without going into much detail it may be said that a pig gains much more rapidly after it attains a certain age. Thus a small animal of 40 lb. should increase about $\frac{3}{4}$ lb. per day, and a larger one, about seven months old or 180 lb. live weight, should gain $1\frac{3}{4}$ lb. per day. The larger animal, of course, consumes the greater quantity of food, yet the amount eaten per 100 lb. increase in live weight is less. Again the breed, the mixing and quality of food, all bear upon the case, but given ordinary skill and assuming 5 to 6 lb. of meal with 3 gallons of separated milk to yield 1 lb. of pork, the output will probably be between eight and 10 score of pork and bacon per cow per annum, or say one and a half pigs per cow. It might reasonably be suggested that the more economical plan is to feed all the pigs to the greater weight, but local conditions of the trade must be taken into consideration.

To rear pigs successfully requires a certain amount of skill, the food suitable for one age and object being unsuitable for another. Sows when with young litters should be fed on sharps and milk, which can be gradually replaced by fine barley meal and bran. Ground oats and bran also make an excellent mash for brood sows. Care must be taken to avoid giving anything that will be likely injuriously to affect the milk of a suckling animal, and for this reason unsound food or house refuse must be avoided. The pigs for small pork should not be allowed much exercise, their sty should be kept dry, and if it has a yard opening to the south so much the better. Separated milk and oatmeal should be the foundation food. Such pigs, if constantly kept in, must be given a supply of cinders; and it is advisable also now and then to keep them short of food, and then add a little sulphur to their next meal. To give them good appetites and make and keep them fat are the main objects, and no surplus food should be kept standing before them. For store pigs and breeding animals a large amount of freedom is desirable. The youngsters can soon be enticed to eat a little from a small trough placed out of reach of the sow; toppings, or toppings with a little sifted barley meal, are suitable foods. At six weeks old the pigs can be allowed to run out in fine weather, and will soon eat a small

amount of whole maize and peas if given to them on the grass. The dairy farmer who has some ploughed land is able to provide additional food, which will do much to keep the expense down. Besides home grown corn such as barley, oats, peas, &c., there are the "root" crops of potatoes, parsnips and swedes, which when boiled and mixed with meal will help to increase the weight of the bacon pigs. Green stuff, such as clover, lucerne, maize, vetches, comes in at various seasons of the year and is a useful adjunct to the bill of fare, especially to breeding animals when not in young.

IMPORTS OF AGRICULTURAL PRODUCE IN 1907.

The total value of the principal articles of food, which may be classed as agricultural produce, imported into the United Kingdom in 1907 was £177,011,000 as against £171,100,000 in 1906.

The number of cattle imported for food showed a decided falling-off, a decrease which was to some extent counterbalanced by larger receipts of fresh beef. There are now only two main sources of supply in the case of live cattle, namely, the United States and Canada ; but our supplies of fresh beef come from the United States, the River Plate and Australasia. During the last few years Argentina has taken a dominating position in this trade, but in 1907 the increasing quantities imported from this source received a check, only 2,692,000 cwts. of fresh beef, valued at 32*s.* per cwt., being received, as against 2,796,000 cwts. in 1906.

The beef received from the United States is of a decidedly higher quality, the 2,418,000 cwts. imported being valued at 42*s.* 9*d.* per cwt.

The imports of fresh beef amounted in all to 5,735,000 cwts., while the weight of beef represented by the imports of cattle may be estimated at 3,071,000 cwts., so that the total receipts of meat of this class from abroad in 1907 was 8,806,000 cwts., or about 22⅓ lb. per head of the population. In 1906 the figures were 9,170,000 cwts., representing 23½ lb. per head, and in 1905 8,716,000 cwts., equal to 22½ lb. per head. The declared value of the fresh beef imported was 36*s.* 3*d.* per cwt., an increase of about 10*d.* per cwt., while live cattle averaged £17 3*s.* 5*d.* per head as against £17 6*s.* 10*d.* in 1906.

IMPORTS of Live and Dead Meat.

Description.	Quantities.		Values.	
	1906.	1907.	1906.	1907.
	Number.	Number.	£	£
Cattle	561,215	472,015	9,732,180	8,105,109
Sheep	103,359	105,601	156,947	168,531
Swine	—	—	—	—
Total live animals ...	—	—	9,889,127	8,273,640
	Cwts.	Cwts.		
Beef, fresh	5,523,809	5,735,003	9,785,607	10,397,102
,, salted	161,363	138,346	217,947	201,222
Mutton, fresh	4,082,756	4,592,142	7,645,935	8,711,931
Pork, fresh	492,121	567,332	1,130,950	1,338,242
,, salted	206,056	254,637	266,800	328,369
Bacon	5,542,622	5,365,605	14,644,115	14,839,201
Hams	1,302,752	1,132,649	3,491,594	3,242,183
Meat unenumerated—				
Fresh	652,363	604,894	1,145,464	1,041,487
Salted...		58,060		87,780
Meat, preserved ...	487,424	316,507	1,822,671	1,534,915
Rabbits, dead	803,556	692,923	1,000,786	862,735
Total dead meat ...	19,254,822	19,458,098	41,151,869	42,585,167
Poultry and game ...	—	—	985,457	1,057,933

In the case of live sheep the marked decrease in the imports which was noticeable in 1905 and 1906 was maintained. In 1904 the number received was 382,000, whereas in the past year it was only 105,601. A distinct increase was noticeable in the imports of fresh mutton, which reached a figure which had not previously been exceeded. The extension in this trade came from New Zealand and Australia, which sent respectively 2,005,000 cwts., and 858,000 cwts., while Argentina contributed 1,402,000 cwts. The exports from New Zealand seem to have been larger than in any previous year.

The imports of fresh mutton amounted to 4,592,000 cwts., while the weight of meat represented by the sheep received alive may be estimated at 57,500 cwts., so that the total receipts of fresh mutton from abroad in 1907 was 4,649,500 cwts., or about $11\frac{2}{3}$ lb. per head of the population. The declared value of the sheep was 31*s.* 11*d.* per head against 30*s.* 4*d.* last year, while the fresh mutton averaged 37*s.* 11*d.* per cwt., compared with 37*s.* 5*d.* in 1906.

The imports of bacon, which had been rising steadily since 1902, decreased and amounted to 5,366,000 cwts. as against 5,543,000 cwts. in 1906. The principal sources of supply were, United States (2,281,000 cwts.), Denmark (1,807,000 cwts.), and Canada (1,192,000 cwts.). The marked increase which has taken place in the price of this form of food as compared with the price some years ago is well shown by the fact that 5,805,000 cwts. were imported in 1899 for the sum of £10,400,000, whereas in the past year 5,366,000 cwts. were valued at £14,839,000; this represents a rise in the declared value from 35*s.* 10*d.* per cwt. in 1899 to 55*s.* 4*d.* per cwt. in 1907, that is nearly 20*s.* per cwt. or 55 per cent.

Rabbits continue to be imported in large quantities from Australia and New Zealand, 538,400 cwts. being received from the former and 75,200 cwts. from the latter, valued approximately at £1 per cwt. Belgian (Ostend) rabbits are worth nearly three times as much, but the quantity received last year was only 62,400 cwts.

Poultry is chiefly received from the United States, Russia, Belgium and France, and game from these and other countries, The total value of the poultry received was £904,000 compared with £869,000 in 1906. Russia's share in this trade amounted to £271,000, that of the United States to £202,000, and that of France to £206,000.

Converting the live animals into their equivalent weight of meat and adding the total imports of dead meat of all kinds (excluding poultry and game), it appears that this country consumed, in addition to the home supply, some 22,586,600 cwts. compared with 22,957,500 cwts. in 1906. The total value credited to the different kinds of live and dead meat was £50,859,000.

In 1906 the imports of butter were higher both in quantity and value than in any preceding year, but in 1907 there was some falling-off. Denmark continues to hold the first place as a contributor to our markets, and the receipts from this source were 1,819,000 cwts. compared with 1,675,800 cwts. in 1906. Russia was the next largest exporting country and supplied 658,000 cwts. The colonies of Victoria, New South Wales, Queensland, and New Zealand sent 901,800 cwts. as against 857,500 in 1906 and 750,700 cwts. in 1905, but the amount

credited to Canada declined from 191,000 cwts. to 34,750 cwts., while practically nothing was received from the United States. France and Holland again sent smaller consignments (281,300 cwts. and 168,500 cwts. respectively), but there was an increase from Sweden. The average value of imported butter was 106*s*. 6*d*. per cwt. compared with 108*s*. 2*d*. in 1906 and 104*s*. 2*d*. in 1905.

IMPORTS of Dairy Produce, Margarine, and Eggs.

Description.	Quantities.		Values.	
	1906.	1907.	1906.	1907.
	Cwts.	Cwts.	£	£
Butter	4,337,258	4,216,435	23,460,196	22,452,460
Margarine	1,101,957	885,068	2,733,795	2,223,645
Cheese	2,638,794	2,372,235	7,607,641	6,905,512
Milk, condensed ...	907,983	911,876	1,563,677	1,599,637
	Great hundreds.	Great hundreds.		
Eggs	18,874,059	18,567,891	7,098,122	7,134,532

Imported cheese comes very largely from Canada, and although there was a decline it was not of such a marked character as in the case of butter, the figures being 1,699,000 cwts. compared with 1,926,000 cwts. in 1906.

No very great change took place in the egg trade, the total imports being 18,568,000 great hundreds compared with 18,874,000 great hundreds in 1906. Russia is the principal source of supply, and furnished 7,179,000 great hundreds, while Denmark and Germany accounted for 3,800,000 and 2,821,000 great hundreds respectively. The average value of eggs from all countries was 7*s*. 8¼*d*. per 120 as against 7*s*. 6¼*d*. in 1906.

Margarine is imported chiefly from the Netherlands, 836,700 cwts. out of a total of 885,000 cwts. being received from that country.

The imports of grain and meal during the cereal year ending 31st August, 1907, were dealt with in this *Journal* in September last. The next table shows the receipts during the calendar year, and it may be noted the imports of wheat exceeded in value those of any previous twelve months. The leading sources of supply were Argentina (21,900,000 cwts.), United States (20,697,000 cwts.), India (18,270,000 cwts.), Canada

(12,470,000 cwts.), Russia (10,900,000 cwts.), and Australia (8,324,000 cwts.). The receipts of flour from the United States were maintained at nearly the same level as in 1906, 9,325,000 cwts. coming from this source compared with 9,810,000 cwts. in 1906 and 5,685,000 cwts. in 1905.

IMPORTS of Grain and Flour.

Description.	Quantities.		Values.	
	1906.	1907.	1906.	1907.
	Cwts.	Cwts.	£	£
Wheat	92,967,200	97,168,800	32,676,185	37,336,830
,, meal and flour ...	14,190,300	13,297,357	6,817,213	6,694,532
Barley	19,934,500	19,628,620	5,677,587	6,565,006
Oats	15,286,500	10,488,290	4,532,160	3,384,577
Oatmeal	661,809	638,702	495,980	479,352
Maize	48,685,200	53,378,950	11,972,694	14,604,159
,, meal	616,250	658,656	195,302	213,581
Peas	1,453,420	1,245,690	614,649	602,648
Beans	634,280	799,569	231,758	290,693
Other corn and meal ...	1,746,352	1,589,158	609,553	644,789
Total	—	—	63,823,081	70,816,167

The average declared value of wheat was 7*s.* 8*d.* per cwt. and of flour 10*s.* 1*d.* per cwt.

There was a marked decrease in the supplies of Russian oats, only 3,068,000 cwts. being received compared with 6,709,000 cwts. in 1906 and 11,200,000 cwts. in 1905.

Maize, on the other hand, substantially increased, and the 53,379,000 cwts. received was the largest amount since 1900. Russia and Roumania, which sent only unimportant quantities in the two preceding years, exported 6,681,000 cwts. and 10,126,000 cwts. respectively to these shores, while the bulk of the remainder was furnished by Argentina (17,688,000 cwts.) and the United States (14,964,000 cwts.).

The most prominent feature in the next table is the large imports of potatoes. The receipts from the Channel Islands, which are made up entirely of early potatoes, were heavier than in the preceding year, being 1,947,500 cwts. against 1,170,000 cwts., while the French exports to this country also showed a large excess over 1906 (2,997,000 cwts. against 1,660,000 cwts.). Owing to the good crop in England the imports of plums were less.

IMPORTS of Vegetables, Fruits, Hops, and Flowers.

Description.	Quantities.		Values.	
	1906.	1907.	1906.	1907.
	Bushels.	Bushels.	£	£
Onions	8,310,534	8,645,048	953,615	1,036,231
	Cwts.	Cwts.		
Potatoes	3,819,787	8,249,463	1,332,027	2,371,617
Tomatoes	1,124,700	1,135,594	953,475	1,020,795
Vegetables, unenumerated	—	—	404,928	365,230
Apples	2,808,732	3,526,213	1,753,577	2,231,327
Pears	576,573	500,142	572,274	478,611
Plums	891,113	325,761	758,720	345,720
Cherries	191,106	165,412	245,906	199,489
Strawberries	52,164	44,178	64,777	54,186
Currants	106,718	109,130	139,773	142,245
Gooseberries	39,374	45,603	22,921	25,994
Apricots and peaches ...	7,646	38,814	17,967	78,583
Hops	232,619	202,324	852,476	763,881
Flowers, fresh	—	—	233,884	233,641

MISCELLANEOUS Imports.

Description.		Quantities.		Values.	
		1906.	1907.	1906.	1907.
				£	£
Horses...	Number	17,848	15,922	535,532	429,549
Lard	Cwts.	2,049,367	1,965,131	4,361,399	4,491,539
Tallow and stearine ...	,,	1,933,836	2,100,152	2,795,821	3,505,091
Wool, sheep or lambs'	Lb.	639,342,939	759,236,745	27,146,133	32,692,967
Sheepskins—					
Woolled	,,*	—	59,050,669	—	2,096,725
Pickled	Number	19,942,374	11,017,793	2,446,677	1,071,857
Hides—					
Wet	Cwts.	533,678	546,939	1,493,859	1,619,719
Dry	,,	484,218	406,314	1,602,944	1,484,570
Clover and grass seeds	,,	300,689	338,443	615,170	683,248
Wood and timber (except furniture woods, hardwoods, and veneers) ...	Loads	10,078,032	9,670,128	25,578,769	24,873,976
Oilseeds—					
Cotton	Tons	624,765	758,152	3,716,567	4,881,653
Flax or linseed ...	Qrs.	1,588,100	2,071,534	3,274,988	4,397,247
Rape	,,	118,149	261,960	234,644	551,157
Oilseed cake	Tons	360,198	329,734	2,362,471	2,134,724
Manures	,,	618,966	695,816	2,184,130	2,437,598
Yeast	Cwts.	171,106	183,793	353,341	356,978

* The number given for 1906 represents the number of sheepskins of both kinds.

Lard comes almost entirely from the United States (1,690,000 cwts.), but tallow and stearine are received also from Argentine and Australasia.

As regards wool there was, notwithstanding the substantial increase in price, the heaviest importation of any year since 1895. As an illustration of the rise in price at the present time, compared with ten years ago, it may be noted that whereas in 1897 £24,684,000 was paid for 741,000 000 lb. of wool, the sum of £32,693,000 was paid in 1907 for 759,000,000 lb. There was, however, no appreciable increase during the past two years in the average declared value, which stood at about 10¼*d.* per lb. in both, as compared with 9¼*d.* in 1905, 8¾*d.* in 1904, 8¼*d.* in 1903 and 7½*d.* in 1902. The bulk of the supply comes from our own colonies and possessions, viz., Australia (321,471,000 lb.), New Zealand (158,406,000 lb.), South Africa (91,606,000 lb.), India (46,717,000 lb.).

The re-exports of foreign wool were also larger amounting to 312,673,000 lb. as against 269,135,000 lb. in 1906, but the balance of foreign wool remaining for manufacture in this country was 446,563,000 lb. as compared with 370,208,000 lb. last year and 338,606,000 lb. in the year before.

Some indication of the range of prices in 1907 as compared with the two preceding years may be gathered from the average declared value of the different articles. Sheep, beef, mutton, pork, bacon, hams, eggs, cheese, wheat, flour, barley, oats and maize all show a rise. The figures for some of the principal articles are as follows :—

Description.		1905.			1906.			1907.		
		£	*s.*	*d.*	£	*s.*	*d.*	£	*s.*	*d.*
Cattle ...	Head	17	2	1	17	6	10	17	3	5
Sheep ...	,,	1	10	5	1	10	4	1	11	11
Beef, fresh	Cwts.	1	15	5	1	15	5	1	16	3
Mutton, fresh	,,	1	18	6	1	17	5	1	17	11
Pork, fresh	,,	2	6	0	2	5	11	2	7	2
Bacon ...	,,	2	6	6	2	12	6	2	15	4
Hams ...	,,	2	7	4	2	13	7	2	17	3
Butter ...	,,	5	4	2	5	8	2	5	6	6
Cheese	,,	2	11	11	2	17	8	2	18	3
Eggs ...	Great hundred	0	7	3	0	7	6¼	0	7	8¼
Wool ...	Lb.	0	0	9¼	0	0	10¼	0	0	10¼
Wheat...	Cwts.	0	7	3	0	7	0	0	7	8
,, flour	,,	0	10	1	0	9	7	0	10	1
Barley...	,,	0	5	7	0	5	8	0	6	8
Oats ...	,,	0	5	6	0	5	11	0	6	5
Maize ...	,,	0	5	3	0	4	11	0	5	6

The Board of Agriculture and Fisheries have addressed the following circular letter dated the 1st January, 1908, (A 156/C) to County Councils and County Boroughs in England and Wales:—

Circular as to the Small Holdings and Allotments Acts.

SIR,

I am directed by the Board of Agriculture and Fisheries to advert to their circular letter of the 30th September last (A. 152/C) with reference to the Small Holdings and Allotments Acts and to say that, as indicated therein, they are of opinion that the first step which should be taken by your Council is to test the extent of the demand for small holdings in their area. The Board would therefore be glad to know what action has been taken or is proposed to be taken by your Council for this purpose, either by the issue of handbills calling attention to the Act and the insertion of advertisements in the local newspapers inviting applications, by inquiries through the Parish Councils and other allotment authorities, or by any other means.

I am also desired to ask that you will inform the Board of the number of applications for land which have been received by your Council and the total quantity of land applied for, and, in addition, the Board will be obliged if you will supply them with copies of any forms, circulars, or other printed matter which have been issued by your Council in connection with the Act.

On the receipt of any applications for land for small holdings, your Council will no doubt endeavour to satisfy themselves as to the qualifications and suitability of the applicants, either by personal inquiries by members of the Council or persons authorised by them, or by the issue of a form setting out the points on which your Council desire information. The Board think that as a general rule such inquiries should be undertaken by means of personal interviews with the applicants, and that sub-committees, consisting partly of members of the Small Holdings Committee and partly of members of the minor local authorities and other suitable persons, should be appointed for this special purpose for each parish or other convenient area from which applications are received. Such a method would generally be more satisfactory and entail less expense than the correspondence which would be involved by the issue of a form containing a detailed list of questions, which might often deter some of the most suitable applicants. The Board do not think it necessary to suggest to your Council the particular points on which information might be sought, which will necessarily vary in individual cases and in accordance with the local circumstances of each county, but they think that it will as a rule be advisable to inquire whether the applicants desire to be supplied with a cottage or other buildings, as the answers to this question will necessarily have an important bearing on the question whether your Council determine to purchase or to hire the land necessary to satisfy the demand.

The Board suggest also for the consideration of your Council that it would be very useful if information could be obtained as to the extent of the land in your county which is in the possession of the Ecclesiastical Commissioners, the beneficed clergy, Universities or Colleges, trustees of charity lands, and other public bodies or corporations, and they suggest that inquiry should be made from such owners as to whether they would be willing to let or sell land to your Council for the purpose of providing small holdings. In this connection I am to point out that Sections 28 and 29 of the Act contain provisions which, at the request of the Ecclesiastical Commissioners, were inserted in order to facilitate the letting of glebe lands for small holdings.

I am further to call your attention to Section 36 of the Act which requires a County Council to appoint a small holdings and allotments committee which shall take the place of the several statutory committees under the Allotments Act, 1890, and the Small Holdings Act, 1892, and to inquire whether this committee has yet been set up, and, if so, to ask for a list of the members and a statement showing the constitu-

tion of the committee, and, in particular, whether it provides for the co-optation of non-members of the Council on the committee.

The Board would also point out that Section 36 of the Act authorises the delegation to the Committee of all the powers of a County Council under the Acts except the power of raising a rate or of borrowing money, and I am to say that the Board are of opinion that with a view of avoiding all unnecessary delay it is desirable that the Small Holdings Committee should be authorised by your Council to conduct all the correspondence relating to the Act and to carry out inquiries &c. without the necessity of having to refer each point to the next quarterly meeting of the Council.

The Board are advised that Section 36, so far as it requires the appointment of a Committee and authorises the delegation of powers to such a Committee, applies to the Councils of County Boroughs as well as to County Councils, but to avoid any question as to the powers of the Committee it is desirable that they should be appointed allotment managers under Section 6 of the Allotments Act, 1887.

The financial assistance which the Board are authorised to give County Councils in connection with their operations under the Act falls under two heads. By Section 5 (4) of the Act the Board are authorised to pay or undertake to pay out of the Small Holdings Account the whole or any part of the loss which results from the carrying out of any scheme under the Act, and during the progress of the Bill through Parliament a pledge was given that a Treasury Minute should be issued stating that the Board would be prepared to pay one half of any irrecoverable loss which was incurred in connection with a scheme carried out by a County Council, provided that the Board were satisfied that the Council had acted reasonably and had taken due precautions. The Board are now in communication with the Treasury as to the form of the Minute and they hope that it may be possible to issue it to County Councils very shortly, but in the meantime I am desired to point out that Section 5 (4) only applies to losses under a scheme, and that, therefore, although County Councils are fully at liberty to take whatever steps may seem to them desirable to provide small holdings, and are not compelled to proceed by means of a scheme in every case, yet it will probably be found prudent, at least in cases where there appears to be some financial risk, to provide the small holdings under a scheme in accordance with Section 3 and 4 of the Act, in order that, in the event of a loss, the Council may be in a position to receive the assistance which the Board can give under Section 5 (4).

The other provision for assistance from the Small Holdings Account is contained in Section 17 of the Act, whereby the Board are authorised to repay or undertake to repay, the whole or any part of the expenses incurred by a county council in proceedings, in relation to the acquisition of land for small holdings. Such expenses would ordinarily include the cost of the valuation and survey of any land proposed to be acquired, the expenses of any local inquiry, the costs of registration of title and other necessary legal expenses, and the Board are considering the issue of regulations under the section laying down the conditions under which the assistance authorised will be given. Your Council will of course not be entitled to look to the Board for repayment of any expenses incurred by them in connection with the management of any small holdings which may be established, but the Acts contemplate the addition to the rents or to the instalments for the purchase of the small holdings of a sufficient amount to cover the cost of management, and a management fund might therefore be set up out of which all such expenses would be defrayed.

The Board believe that it will very much conduce to the satisfactory administration of the Act if a special officer of the Council is designated to deal with the business arising under the Act. Such an officer could act as clerk to the Small Holdings and Allotments Committee, and he might also be responsible for attending and reporting the meetings of the local sub-committees and for making such inquiries as the committee might direct into the suitability of the applicants for land and the possibility of meeting their demands. In addition he could undertake the management and supervision of the small holdings when established, and the collection of the rents, and could act generally as the estate agent of the Council for all the land

acquired by them under the Act. The salary of such an officer would to a considerable extent be recoverable from the management fund above referred to.

The Board do not suggest that such an officer of the Council should be employed to advise them in connection with the valuation for purchase or hiring of any land proposed to be acquired for small holdings. They think that for such work the Council will prefer to engage the services of an experienced professional valuer, who would be paid by fees calculated on the usual scale, and I am to point out that the adoption of this course would facilitate the adjustment of any application by your Council for the repayment under Section 17 of their expenses in relation to the acquisition of land.

The Board have received certain inquiries as to the form in which a scheme for the provision of small holdings under the Act should be prepared, and in the case of schemes under Sub-section (3) of Section 3, which would be of a somewhat different character from schemes prepared under Sub-section (4), the Board think that they might take the form of a report made to the Council by the Small Holdings Committee setting out the land proposed to be acquired, the price or rent at which it can be obtained, the manner in which it is proposed to be sub-divided, and the method and cost of the equipment, in order that the Board may be in a position to judge whether the scheme is of such a character that they would be justified in giving it their approval and thereby undertaking under Section 5 (4) to repay half of any loss which might be incurred. Where the Council propose to acquire land at a sale by auction this procedure may create some difficulty, but in most other cases it should be possible to frame a scheme on these lines before the Council unconditionally enter into a contract for the purchase or hiring of land, and where land is acquired at an auction the Board will be ready to consider a subsequent application for their approval. In these circumstances the Board do not think that any model form of scheme can conveniently be prescribed, and they are of opinion that each County Council should submit their proposals in the form which appears most convenient in the particular circumstances of each case. It will probably be desirable to prepare a separate scheme for each individual transaction, and the Board will be glad to be informed at an early stage in the proceedings of any action proposed to be taken, in order that they may have an opportunity of expressing their opinion before a decision is arrived at as to the particular land to be acquired.

Under Section 7 of the Small Holdings Act, 1892, as extended by Section 10 of the Act of 1907, your Council are required to make rules which will have to be confirmed by the Board. Model rules are therefore being prepared by the Board for this purpose, and copies will be sent to you at an early date.

It appears that a large number of small holdings associations are in process of formation with a view of applying for land under Section 9 of the Act, and having regard to the necessity of the Board's consent being obtained to any such letting, I am to request that, if any such applications are made to your Council, you will furnish the Board with a copy of the rules of the association, in order that they may be in a position to judge whether the association conforms to the conditions prescribed in the section.

The Board propose to issue a circular to Parish Councils with reference to their powers and duties in regard to the provision of allotments, and copies of such circular will be sent to you for the information of your Council in connection with their functions under Section 24 (1) of the Small Holdings Act, 1907.

I shall be glad to forward to you additional copies of this Circular on application, and I am to add that the Board will be happy to afford your Council any assistance or advice which it is in their power to give in connection with any matters which may arise under the Acts.

I am, &c.,

T. H. ELLIOTT,

Secretary.

Freight Charges on United States Wheat.

The advantage enjoyed by the British farmer in the production of wheat owing to his proximity to the home market was estimated in this *Journal* (June, 1903, p. 91) to amount at that time to from 15*s*. to 20*s*. per ton, or 3*s*. 2*d*. to 4*s*. 4*d*. per quarter, in the case of the bulk of the United States grain coming through the Atlantic ports. These figures represented broadly the cost of transport from some of the great interior markets, like Chicago or St. Louis, to Liverpool, but were exclusive of charges incurred by the American farmer in moving his crop from the farm to the central market. A recent investigation by Mr. Frank Andrews of the United States Department of Agriculture shows that these latter expenses may easily exceed, as they frequently do in Great Britain, the whole cost of the long distance transport.

The average cost of carrying wheat from the farms in the United States to the local railway stations was ascertained from returns from 1,051 wheat-producing counties to be $4\frac{1}{2}d$. (9 cents) per 100 lb., or $2\frac{3}{4}d$. (5·4 cents) per bushel. The actual cost to an individual farmer at a given time may vary greatly; he may cart his wheat when he has nothing else to do and when his horses would otherwise be idle, or he may be compelled to carry it at a time and under conditions which involve no little sacrifice of labour and expense. In order to arrive at the average value it was assumed as a basis that in any given community the usual cost per day of hiring wagon, horses and driver is a fair measure in that community of the average outlay of capital and labour required to perform the work. The average cost as stated above, was found to be $4\frac{1}{2}d$. per 100 lb., but in the North Central States it was 4*d*. (8 cents); in Kansas, Ohio, Indiana and Michigan it was 3*d*. (6 cents); in Illinois, Wisconsin, Minnesota, Iowa and Nebraska it was $3\frac{1}{2}d$. (7 cents); in Missouri $4\frac{1}{2}d$. (9 cents); in North Dakota 5*d*. (10 cents); in South Dakota $5\frac{1}{2}d$. (11 cents); and 5*d*. (10 cents) in the wheat region west of the Rocky Mountains. The higher rates are largely due to the long distances over which the grain has to be carried.

From the regions east of the Rocky Mountains large quantities of the grain are gathered into such interior cities as Minneapolis, Chicago and Kansas City. The mean of the railway

rates from 562 local stations in Illinois and Nebraska to Chicago in 1905–6 was 8*d.* (16 cents) per 100 lb., the same as the mean rate to Minneapolis from 311 local stations in Minnesota, North Dakota, South Dakota and Nebraska. To Kansas City from 456 stations in Kansas, Missouri and Oklahoma, the mean rate was found to be 7*d.* (14 cents) per 100 lb. Making allowance for the relative quantities of wheat received at each of these primary markets during 1905–6, the average rate from local railway stations to primary markets was $7\frac{3}{4}d.$ (15·5 cents) per 100 lb., which added to the cost of carriage from farms makes the total cost of transportation 1*s.* $0\frac{1}{4}d.$ (24·5 cents) per 100 lb., or about $7\frac{1}{4}d.$ (14·7 cents) per bushel.

From the interior wheat markets to the seaboard there are two general routes, one eastward to Atlantic ports and the other leading south to the Gulf of Mexico. Along the eastward route the railroads have to share their traffic with the waterways formed by the Great Lakes and the connecting rivers and canals. The Mississippi River is a potential, though not always an active, competitor for the traffic from the wheat regions to New Orleans. During 1904 and 1905 practically no wheat was carried by river from St. Louis to New Orleans.

The mean rate in 1905 from Chicago to New York by lake and rail, that is by boat on the Great Lakes to Buffalo and thence by rail, was $3\frac{1}{4}d.$ (6·40 cents) per bushel; by rail all the way it was nearly 5*d.* (9·90 cents); and by the Lakes and the Erie Canal it was $2\frac{3}{4}d.$ (5·53 cents) per bushel. The railway rate to other ports varied slightly, but it may be taken that the mean all-rail rate from Chicago to the Atlantic seaboard was under 4*d.* (7·8 cents) per bushel.

The cost from the markets further west and from local stations east of the Rocky Mountains to the Atlantic seaboard is estimated at $6\frac{3}{4}d.$ (13·4 cents) per bushel, which is the mean rate from Kansas City and Omaha, while the rate to Gulf ports, New Orleans and Galveston is put at $5\frac{1}{2}d.$ (10·8 cents). The average rate from local stations to both coasts, allowing for the relative quantity of wheat exported from each, would be $6\frac{1}{4}d.$ (12·6 cents) per bushel.

Ocean rates were higher than usual during the year 1905–6, and the mean charge for carrying wheat by regular steamship lines to Liverpool from New York, a distance of about 3,100

miles, was less than $2d.$ (3·8 cents) per bushel, or $\frac{3}{4}d.$ (1·6 cents) less than it cost a farmer to transport it $9\frac{1}{2}$ miles from his farm to a neighbouring railway station. The cost of shipment in chartered vessels from Baltimore was nearly $4d.$ (7·8 cents) per bushel, and by regular lines from New Orleans it was about $3\frac{1}{2}d.$ (6·8 cents), but it is considered that the average rates from Baltimore, New Orleans, and New York, not including costs of transfer, may be put at $2\frac{1}{2}d.$ (4·8 cents) per bushel.

The Pacific Coast wheat trade is distinct from the trade east of the Rocky Mountains, and the grain is carried almost entirely in sailing vessels. The rate quoted from San Francisco, Portland, Tacoma and Seattle to the United Kingdom was about $8\frac{1}{2}d.$ (16·8 cents) per bushel, and the railway charge from local stations to these ports was just over $5d.$ (10·2 cents), so that the total transportation cost was $1s.\ 1\frac{1}{2}d.$ (27 cents) per bushel.

From these figures it may be inferred that the average cost of the carriage of wheat from farms in Illinois and Nebraska *viâ* Chicago to Liverpool was about $1s.\ 1\frac{1}{2}d.$ (26·9 cents) per bushel, made up as follows: Carriage from farm, 4·2 cents; average railway rate from local stations to Chicago, 9·6 cents; average rate, Chicago to New York, 7·8 cents; freight to Liverpool, 3·8 cents; and minor costs of sale and shipment, 1·5 cents.

Wheat sent from Kansas through the Gulf ports would cost rather less, viz., carriage from farm, 3·6 cents; railway rate to Gulf ports, 10·8 cents; ocean freight, 6·8 cents; and minor costs, 1·5 cents; making in all 22·7 cents, or $11\frac{1}{4}d.$ per bushel. On the whole the average cost, excluding the Pacific Coast, is probably slightly over $1s.$ a bushel.

The charge for ocean transport, though small, is an important item in the wheat trade of the United Kingdom. As stated above, the rate from the Atlantic and Gulf ports of the United States, averaged about $2\frac{1}{2}d.$ per bushel in 1905–6, but from most other countries, except Canada, it was more. Thus, from Russian Black Sea ports and Roumania the freight averaged $3\frac{1}{2}d.$, from India $4\frac{1}{2}d.$, from Argentina $5\frac{1}{2}d.$ and from Australia $7d.$ The highest rate from any country of importance is that of $8\frac{1}{2}d.$ charged from the Pacific ports of the United States.

Agricultural Show at Buenos Ayres.

The Board have received through the Foreign Office a report by Mr. Townley, His Majesty's Minister at Buenos Ayres, on the annual agricultural show of the Argentine Rural Society, which was opened on the 8th September in the presence of the President of the Republic, by the Minister of Agriculture, Senor Ramos Mejia. His Excellency laid stress on the progress which had taken place in cattle breeding in Argentina, as was shown by the excellence of the animals exhibited, and he prophesied that in a few years Argentina would not need to import pedigree stock. He said that the irregularities which had been brought to light in connection with the application of the tuberculin test to imported bulls had led to some grossly exaggerated statements regarding the prevalence of tuberculosis among Argentine herds. Statistics showed, he said, that of 2,000,000 animals slaughtered during the past five years at the slaughter-houses of Liniers (which supply the capital with meat) only three per thousand were found to be tuberculous. The open-air system of cattle breeding which is universal in the country was unfavourable to the development of the disease, as was shown by a comparison of the above figures with those which related to cows kept in the metropolitan dairies, 15 per cent. of which were declared to be tuberculous. The Government did not contemplate taking any drastic measures in connection with this matter which would put undue burdens on cattle breeders. They were having an exhaustive study of the subject made by eminent scientists from which they hoped beneficial results. Senor Ramos Mejia stated that the area under grain amounted to 17,791,200 acres, being 494,200 acres more than in 1906, and that the present condition of the crops was excellent.

The judges at the show included Messrs. H. Dudding, J. W. Hickling and W. Wright, three Englishmen who had come specially from England at the invitation of the Argentine Rural Society.

The most notable exhibits were in the class of Shorthorn cattle. Mr. Wright stated that in the course of a long experience as judge at many of the principal shows in Great Britain he had never seen such a large number of so high a class of

Shorthorn cattle together. There was a large class of Herefords, also of very high quality. The horses on the whole were disappointing both in quality and quantity. They included classes of Shires, Clydesdales, Percherons and Hackneys. The largest classes of sheep were the Lincoln and Rambouillet breeds ; the others included Romney Marsh, Shropshire Down, Oxfordshire Down and Hampshire Down. The pigs included Middle Whites and Berkshires.

The principal agricultural implement importers had pavilions at the show, but the show is essentially a cattle show and attracts cattle breeders almost exclusively.

Great interest centred round the sales which took place in the show rings daily. The prices on the whole were lower than last year. Among the cattle, the winner of the prize for the best animal exhibited, male or female, a Shorthorn Bull, " Newton Stone II," born in March, 1906, was sold for $20,000 (£1,745). It was generally expected that he would have been sold for £600 or £700 more. Six other bulls were sold at prices ranging from £1,309 to £872. The average price obtained by the leading breeders for pedigree bulls in the last three years was as follows : 1905, £346 ; 1906, £340 ; 1907, £304. Newton Stone, the sire of this year's champion, Newton Stone II, was bought in Great Britain some years ago by the owner and breeder of the champion for £2,600. The champion horse in the heavy weight draught class, a two-year-old Shire, was sold for £540.

Agriculture in Normandy.

In a report, furnished to the Board by the Foreign Office, on the agricultural conditions prevailing in the districts of Caen and Lower Normandy, Mr. Vice-Consul Hettier observes that the department of the Calvados is a rich agricultural country, and the trade in live stock and other products has always been important. As regards cattle the Norman farmers, as a rule, content themselves with their native breed. A few Jersey cows are bought, but are considered to need too much care. Forty years ago the Cotentine race of cattle was crossed with the Shorthorn, and the present breed is the result. They are largely sold in Paris, but are not exported. There does not

seem to be any opening at present for the importation of pedigree or other cattle from Great Britain. Light and heavy horses are sold for exportation to Great Britain, the United States, Spain, Japan, &c.

Agriculture in general is considered to have developed greatly in recent years, and this progress is likely to result in increased competition with English producers. Barley, potatoes, fruits of various kinds, dessert apples, eggs, cheese, &c., are exported in increasing quantities annually. Apples, however, are exceedingly scarce this year, and may be imported. The demand for cider apples is unlimited; last year large quantities were brought from Spain, but, owing to late delivery and slowness of transport, they arrived in such a bad state that they could not be utilised. English apples would find a ready market in Normandy.

As regards agricultural machinery, Mr. Hettier observes that the farmers are very unwilling to adopt new implements. They buy some, but not until they have seen them tried on some more enterprising neighbour's land. The machines mostly in use are mowers and ploughs. The "Syndicat Agricole du Calvados" sells every year a certain number of these machines, which are of German and American make, but Mr. Hettier is convinced that machines from England, if properly exhibited and better known, would become popular.

Chemical Manure Trade of Egypt.

The following particulars of the chemical manure trade of Egypt are extracted from the October issue of the *Journal of the British Chamber of Commerce* of Egypt:—

A trade in Egypt which has been increasing by leaps and bounds during the past three or four years, and which will undoubtedly continue to do so for some time to come, is that of artificial fertilisers. Statistics, which have been prepared from the Custom-House returns, show that in 1902 the total imports of chemical manures were 2,000 metric tons, valued at £E13,000, whilst in 1906 the figures were nearly 13,000 metric tons, valued at over £E122,000. For the first nine months of 1907 the deliveries amounted to 7,579 metric tons, valued at £E76,907.

Apart from the influence of the Assouan Dam and other irrigation works in largely increasing the area of cultivable land, and so causing a bigger demand for manures, the main reason for the recent rapid growth in the trade is the fact that the native is now endeavouring to grow cotton once every two years instead of once in three, and, consequently, finds that he must return something to the land which will replace the nourishment taken out of it by the cotton.

Prior to the introduction of artificial fertilisers, the credit for which is due almost entirely to the Khedivial Agricultural Society, the native mainly depended upon "sabakh," that is to say, the remains of old buildings, villages and cemeteries for his manure. Such remains—generally in the form of small hills—were found all over the Delta, but they are gradually becoming appreciably scarcer, or too far away from the centres of cultivation. Other native manures are river and canal mud and stable refuse, but these, together with "sabakh," are totally insufficient to meet the requirements of the country, and it is considered, therefore, that chemical manure imports are likely to develop still further.

Owing to the very small Egyptian demand prior to last year, it was found cheaper and more convenient to bring the nitrate of soda from Chili to Belgium and then tranship to Alexandria according to requirements. This largely accounts for the fact that in 1905 Belgium had practically the whole of the Egyptian trade. In 1906, the sales having increased so enormously, the Khedivial Agricultural Society of Cairo chartered two vessels and brought full cargoes (besides having part cargoes on other ships) direct from Chili to Alexandria, and the same process is being repeated this year. Belgium is the principal source of supply for superphosphate, the manure being actually prepared in that country. Glasgow also ships a small quantity of superphosphate, but Antwerp does nearly the whole of the trade. In the case of sulphate of ammonia, the main port of shipment is Glasgow, after which comes Antwerp. Practically the only manures manufactured in Egypt are those turned out by a Cairo company, such as "poudrette" and other sewage products.

The Khedivial Agricultural Society has interested itself in the distribution of chemical manures during the past six or

seven years. With the object of assisting the Society in this work, the Government between September and December, 1906, lent them £100,000 at 2 per cent. per annum interest. Speaking on the above matter in his report for the year 1906, Lord Cromer said that the whole of the £100,000 "was employed and reimbursed to the Society, which was thus in a position to repay the Government. In view of the large amount of money required in the future, the Government has informed the Society that it is unable to advance further sums. The question thus becomes one of ordinary commerce. So long as the Government advanced money to the Society at a low rate of interest, and the Society distributed manure at a profit of only 2 per cent., it was obviously impossible for commercial enterprise to enter into competition with the Society. In future the Society will not be able to carry on the whole of this work as in the past. Commerce will, it is hoped, gradually replace the Society, and, by selling at a reasonable price, will induce cultivators to obtain their supplies through this channel."

The imports of chemical manures are allowed into the country duty free, and special reduced rates are in force on the State Railways for carriage into the interior. It will thus be seen that the Government is encouraging the native, as far as possible, to use chemical manures. There is no monopoly for the import of artificial fertilisers, and any manufacturer or merchant is thus able to engage in the trade.

Boundary Fences.

As the Board occasionally receive inquiries as to the legal position in regard to the repair of boundary fences, it may be useful to state in general terms the legal position in this respect.

At common law the owners and occupiers of adjoining fields are not bound to fence either against or for the benefit of each other, but each person is bound to prevent his cattle or other animals from trespassing on his neighbour's premises.

A liability to repair a fence can only be created by Act of Parliament, as is done in certain Inclosure Acts and Railway Acts, by prescription or by some agreement or covenant which constitutes a binding contract between the parties. Evidence of such an agreement may be implied by the fact

that a person has repaired a fence when called upon to do so; but it depends on the strength of such evidence and the circumstances under which the repairs were made whether it will be sufficient to establish a liability to repair. The fence may have been erected by the owner on his own land to prevent cattle from straying upon the property of a neighbour, and the mere fact that it had been repaired by the owner is not sufficient to establish a liability on his part to keep it in repair, for the habitual repair of a fence is perfectly consistent with the contention that the repairer has kept his fence in order for his own purposes, and is no evidence of any obligation to repair it for the benefit of a neighbour.

To prove a right by prescription very similar evidence is required, showing the uninterrupted enjoyment of the alleged right to enforce repair for a period of forty or in some cases twenty years.

Notice to Horse-Slaughterers as to Glanders or Farcy.

The Board of Agriculture and Fisheries are desirous of calling the attention of persons licensed to slaughter horses to the obligation imposed upon them by the Glanders or Farcy Order of 1907, to report at once to the police in the event of their having in their possession a carcase of any horse, ass or mule affected with or suspected of glanders or farcy. The Board think it desirable at the same time to warn such persons of the danger of the contraction of the disease by human beings through contact with an infected carcase.

For this purpose the Board have prepared the following Notice which is being distributed to persons occupying slaughter-houses or knackers' yards.

Notice to Slaughterers, Knackers and other Persons engaged in Great Britain in Slaughtering Horses.

GLANDERS OR FARCY.

The attention of persons licensed to slaughter horses in Great Britain is called to the obligation imposed by Article 3 (2) of the Glanders or Farcy Order of 1907, made by the Board of Agriculture and Fisheries, which comes into operation on the 1st January, 1908. That Article requires every person licensed

to slaughter horses, who has in his possession a carcase of any horse, ass or mule affected with or suspected of glanders or farcy, to give notice of that fact with all practicable speed to a constable of the police force for the police area wherein the carcase is. In the County or City of London the notice is required by the London (Notification of Glanders) Order of 1907 to be given either to an Inspector of the Local Authority or to a police constable.

Failure to give such notice renders a person liable to a fine of £20, and, in certain circumstances, to a month's imprisonment with hard labour.

The Board think it desirable also to warn persons that the disease may be contracted by a human being from a diseased horse by inoculation through a wound or by rubbing a mucous membrane, such as that of the eye, with the soiled fingers, and that care should therefore be exercised in the handling of carcases of horses which may be affected with the disease or suspected of being so affected, in order that this risk may be avoided.

T. H. ELLIOTT, *Secretary.*

The symptoms of Glanders and Farcy may be summarised as follows :—The disease is called "Farcy" when located on the surface of limbs or body ; "Glanders" when the principal symptoms are seen in the nostrils, submaxillary glands, and lungs. A horse may be affected with Glanders and show no symptoms except slight unthriftiness. This is called occult Glanders, and can only be diagnosed by the mallein test.

In typical clinical cases there is a thick grey-coloured discharge from one or both nostrils. Ulcers and ulcerous patches are seen inside the nasal cavities, and the glands under the jaw are enlarged and hard. The temperature may be raised, but in chronic cases it may be no higher than the normal. In severe and acute cases the temperature is several degrees above normal, and the animal shows distinct symptoms of respiratory disease. In Farcy one or more limbs become swollen. The lymph vessels stand out prominently on the inside of the limbs. The vessels give a cord-like feel to the hand, and small nodules appear along the course of the vessels. These nodules frequently burst and become ulcers, which discharge a thick, yellow fluid of oily appearance. The ulcers may heal and leave a scar, but they usually break out again. Farcy may also appear on the skin of the neck and body.

After death one sees the ulcers on the skin if Farcy has been present. Besides what is seen in the live animal, ulceration of the throat and air passages may also be found. The most constant changes are, however, found in the lungs. In acute Glanders, small grey nodules about the size of a pin-head are seen all through the lung substance. In the chronic forms the nodules in the earlier stages appear as small grey patches with a red margin. Others are of pus-like consistence. The older nodules are hard and shot-like to the touch ; some of them are gritty—calcification. The number of nodules in a lung varies from one or two to hundreds. The donkey suffers from an acute form of Glanders, in which the lungs are inflamed over a large surface. The tissue is solid, and on section the surface of the lung has a greyish red colour.

The Board have issued the following circular to Local Authorities in Great Britain on the subject of the Butter and Margarine Act, 1907:—

Circular as to the Butter and Margarine Act, 1907.

12th December, 1907.

SIR,

I am directed by the Board of Agriculture and Fisheries to inform you that the Butter and Margarine Act, 1907, comes into operation on the 1st January, 1908, and to suggest that your Council should consider at an early date the steps which should be taken in order to carry out the provisions of the Act in their district.

Some of the principal provisions of the Act are intended by means of regulation and inspection of the re-working of butter to prevent its adulteration with milk or water, or with fats other than butter fat. To give full effect to these provisions your Local Authority should take all practicable steps to ensure that after 1st January, 1908, no premises in their district shall be used for the blending or re-working of butter unless the premises have been registered with them in accordance with section 1 of the Act.

If your Local Authority have any reason to suppose that butter is being blended or re-worked in any unregistered premises, I am to ask that they will cause the matter to be reported to the Board of Agriculture and Fisheries, so that the Board may authorise one of their officers, under section 2 (3) of the Act, to enter and inspect the premises.

The Act provides that premises which form part of or communicate, otherwise than by a public street or road, with premises where margarine, margarine cheese, or mixtures of butter with milk or cream are manufactured or dealt in wholesale, shall not be used as a butter factory, and it will be the duty of Local Authorities to refuse to register such premises as butter factories and to take steps to prevent the use of such premises for the blending or re-working of butter. But if any such premises were being used as a butter factory on 1st January, 1907, and then formed part of or communicated with premises registered under the Acts then in force, the application for registration should be forwarded to the Board of Agriculture and Fisheries so that they may consider whether they should exercise in favour of the applicant the power conferred on them by the proviso to section 1 (3) of the Act.

Your Local Authority have power, under section 2 (2), specially to authorise an officer who is empowered to procure samples under these Acts to enter any registered butter factory, and this power may be found useful in enforcing the new Act, and particularly section 3 of it which, in effect, prohibits adulterants in butter factories, and section 4 (1) which limits the amount of water in factory butter to 16 per cent.

If in the course of sampling under the Food and Drugs Acts the officers of your Local Authority find that butter is being retailed in their district which contains more than 16 per cent. of water and which appears to have come from a butter factory outside their district, or to have been imported from abroad, the Board would be obliged if you would cause the circumstances to be reported to them.

Section 8 regulates the use of names in connection with margarine on wrappers, packages, labels, advertisements, and invoices. Every such name must include the word "Margarine" printed in the same colour and in type as large as, or larger than, the rest of the name, and the Local Authority should instruct their officers to report to them all cases in which this provision is not complied with. The section also requires that the name shall be approved by the Board, but it appears to the Board that the enforcement of this further provision can for the present more conveniently be carried out by their own officers. If, however, your Local Authority so request, the Board will forward to you lists of the names which have been approved by them.

The manufacture and importation of margarine containing more than 16 per cent. of water is prohibited by section 4 (1) and 5 (1) (f) of the Act. In any case in which

the Local Authority find that margarine containing more than 16 per cent. of water is being sold in their district it is desirable, whether they take proceedings or not, that they should, if possible, ascertain where the retailer procured the margarine and inform the Board so that samples of margarine of the same brand may be taken either by the Board's officers at the margarine factory or by the Custom Officers at the port of landing.

The Act also regulates the trade in mixtures of butter with milk or cream (see especially section 1, sub-sections (1) (b) and (2), section 4 (2), and section 9. It is important that your Local Authority should take such steps as are practicable to ensure that all premises where such mixtures are made or dealt with wholesale shall be registered as the premises of a manufacturer or wholesale dealer as the case may be. If there is any reason to suspect that any unregistered premises are being used for the manufacture of such mixtures the Local Authority should report the circumstances to the Board.

The Board will communicate to you from time to time any name and description approved by them for use in connection with any such mixture.

Under section 4 (2) it will be illegal after the Act comes into operation for any person to manufacture, sell, expose, or offer for sale or have in his possession for the purpose of sale any mixture of butter with milk or cream containing more than 24 per cent. of water. If a sample of such a mixture taken in your district is found to contain more than 24 per cent. of water the Board would be obliged if, in addition to taking any proceedings they may think desirable against the retailer of the article, your Local Authority would cause the circumstances to be reported to the Board so that further samples may be taken by the Board's officers at the factory where the article was produced.

Your attention is drawn to the new definition of "margarine" in section 13 which covers any article of food, whether mixed with butter or not, which resembles butter and is not a mixture produced by mixing or blending butter with milk or cream other than condensed milk or cream.

Copies of the new Act are now obtainable, either directly or through any Bookseller, from Wyman & Sons, Ltd., Fetter Lane, London, E.C.

I shall be glad to forward to you additional copies of this circular on application.

I am, &c.,

T. H. ELLIOTT,

Secretary.

Cost of Feeding Chickens.

With the object of testing the system of dry-mash feeding, an experiment was carried out by University College, Reading, on the College Poultry Farm, Theale, during 1907. What is known as hopper feeding is being largely adopted in America, where it is claimed that it is superior to all other systems. The food consists of dry meals, which are kept always before the birds, so that they can eat whenever they desire to do so.

Location.—In this experiment twenty-five White Wyandotte chickens were taken from the brooders on 7th May, when they were exactly four weeks old. Up to that time they had been fed on a dry food mixture, consisting of various seeds and

grains. They were placed in a large grass run, where there was an abundance of natural food, and remained there until the end of July. The house in which they were accommodated was roomy, and had an open-fronted shelter.

Cost in First Four Weeks.—In an experiment made in 1905 (*Journal,* August, 1905, p. 257) the cost of chickens at one month old was found to be as follows :—

	Per Chicken. *d.*		25 Chickens. *d.*
Cost of egg	1·43	...	35·75
Cost of working incubator	0·2	...	5·0
,, brooder	0·2	...	5·0
Food cost, 4 weeks	1·01	...	25·25
Total cost, 4 weeks ...	2·84	...	71·0

Food.—The food placed in the hoppers, of which there were two, consisted of the following :—(*a*) Dry mash, consisting of 20 lb. bran, 10 lb. toppings, 10 lb. Indian meal, 1 lb. linseed meal, and ½ lb. clover meal ; a total of 41½ lb. Cost, 7*s.* 3*d.* per cwt. (*b*) Meat (Spratt's crissel) ; costing 26*s.* per cwt.

The albuminoid ratio of the dry mash is 1 : 5·36, and of the meat 1 : 0·41, or taking the respective quantities consumed, an average of 1 : 3·74. As the food was renewed in the hoppers as required, the weekly consumption is not shown, but only the total quantities.

The quantities of food consumed from 7th May to 30th July, when the experiment was concluded, a period of twelve weeks, are given below :—

	Weight. Lb.		Cost. *d.*
A. Meal	171¼	...	133
B. Meat	63	...	175·5
C. Grit	47	...	15·0
	281¼		323½

Grit was also kept in a hopper constantly before the birds. Thus the total cost of feeding the twenty-five birds for twelve weeks (age four to sixteen weeks) was £1 7*s.*, or an average of nearly 1*s.* 1*d.* per bird. If we add the cost up to four weeks old we get a cost of 1*s.* 3¾*d.* per bird, or 32*s.* 10½*d.* for the twenty-five.

The weekly weights and increases made during the twelve weeks were as follows:—

Week ending, 1907.	Gross Weights.	Weekly Increases.	Average Weights.	Average Gain in Weight.	Total Average Gain in Weight to Date.
	Oz.	Oz.	Oz.	Oz.	Oz.
May 7th ...	181	—	7·24	—	—
,, 14th ...	285	104	11·4	4·16	4·16
,, 21st ...	401	116	16·04	4·64	8·80
,, 28th ...	515	114	20·6	4·56	13·36
June 4th ...	617	102	24·68	4·08	17·44
,, 11th ...	707	90	28·28	3·6	21·04
,, 18th ...	818	111	32·72	4·44	25·48
,, 25th ...	910	92	36·4	3·68	29·16
July 2nd ...	1,020	110	40·8	4·4	33·56
,, 9th ...	1,117	97	44·68	3·88	37·44
,, 16th ...	1,215	98	48·6	3·92	41·36
,, 23rd ...	1,306	91	52·24	3·64	45·00
,, 30th ...	1,406	100	56·24	4·00	49·00

From this table we find that the average gain in the first four weeks recorded was 17·44 oz.; in the second four weeks was 16·12 oz.; and in the final four weeks was 15·44 oz. In the 1905 experiment the average weight at twenty-four hours old was found to be 1·33 oz., so that the total average gain in the sixteen weeks was 54·91 oz.

Comparisons with Previous Experiment.—For the purpose of comparing the respective results of dry grain (with some soft food) and dry mash (hopper fed), the figures given above may be compared with those obtained in the earlier experiment (*Journal*, August, 1905, p. 259), which ended at the age of thirteen weeks:—

GENERAL COMPARISONS, 13 WEEKS.

	1905 (30 Birds). Dry Grain.	1907 (25 Birds). Dry Mash.
Total food consumed...	2 cwt. 0 qr. 13 lb. 1 oz.	1 cwt. 2 qr. 20 lb. 4·16 oz.
Total cost of food	16*s.* 6*d.*	18*s.* 0·7*d.*
Weight of food consumed to each lb. gained	4·16 lb.	2·78 lb.
Average cost of food per bird ...	6·8*d.*	8·67*d.*
Cost of increased weight per lb. gained	3·45*d.*	3·2*d.*
Average gain in weight	1 lb. 15·5 oz.	2 lb. 11·35 oz.
,, weights (13 weeks)	2 lb. 1 oz.	2 lb. 12·68 oz.
,, total cost per bird	8·63*d.*	10·5*d.*

In 1905 the dry grain was given at fixed times, and any left was removed after about three-quarters of an hour. The dry mash, as explained above, was placed in the hoppers, so that the fowls could help themselves.

From these figures it will be seen that the increased cost of food, due to its being of a more expensive nature by reason of the large amount of meat consumed, is more than compensated by the greater growth, at a lower cost for every pound increase of weight. Hence it is apparent that the hopper system of feeding and the use of dry mash are worth the attention of poultry breeders and deserve a fair trial. Whether the food supplied could not be cheapened remains to be tested.

EDWARD BROWN.
WILL BROWN.

The Oyster-Shell Bark Scale.

This scale insect (*Aspidiotus ostreæformis*), whose shield or covering bears, on occasion, a resemblance to an oyster shell, is injurious in our country to various fruit trees. By draining away the sap the plant is weakened, and, where the scales are in excess, killed.

The insect belongs to the family *Coccidæ* or scale insects, and the sub-family *Diaspinæ*. The characteristic of the *Diaspinæ* is that the shield or scale covering the body of the insect in various stages is composed partly of the insect's moulted or cast skins and partly of matter secreted by the insect. *Aspidiotus ostreæformis* infests apple, pear, plum, cherry and allied rosaceous fruit trees; it has also been found on currant, and Green and Newstead* record it on *Calluna*, heather or ling.

DESCRIPTION.—The following stages occur: egg, larva, second stage of male and female, followed, in the female, by the adult; while in the male the second stage is followed by a pupal stage which is succeeded by the adult.

Female Scale or Shield.—On smooth bark where not overcrowded, the fully formed shield may have a diameter of

---

* *A monograph of the British Coccidæ* (Ray Society), by Newstead, vol. i, p. 102.

over 2 millimetres. It is round, not much raised, and smooth. The central part of the scale is dark coloured, the rest being yellow-brown or dark grey. Over-crowding causes considerable variation in the shape of the scale. Owing to its flatness and its close adherence to the bark, it may become more or less incorporated with or covered by scales of the epidermis of the plant or loose external matters, and thus, with a colour resemblance to the bark, the scale may easily pass unnoticed.

Adult Female.—The female is flat, almost round, and yellow. As adult the female is without eyes, legs and wings, and has only rudimentary antennæ. There is a characteristic piercing and sucking mouth apparatus. The hind region of the abdomen shows, under magnification with the microscope, five groups of circumgenital glands, the anterior group having fewer pores than the lateral groups.

Male Scale.—The male scale or shield is small, measuring only 1 m.m.; it is rounded oval or, in other cases, elongate oval.

Adult Male.—The adult male insect is orange-yellow in colour, with a dark band across the thorax. The male has antennæ, legs, and two wings, but no functional mouth.

Male Pupa.—The pupa has no mouth organs, but has antennæ, legs, and signs of the future wings. It is yellow in colour, with the eyes and ocelli, black.

Second Stage of Male and Female.—The insect in this stage is without wings or legs, being unable to move; it remains anchored to the bark by its rostrum.

Larva.—The larva from the egg is very minute but is fairly active; a pair of 6-jointed antennæ, 6 legs and sucking mouth apparatus are present.

LIFE HISTORY.—The winged males appear towards the end of April or in May, according to the weather conditions. By this time the females are adult and fertilisation takes place. Eggs are laid containing larvæ ready to hatch. The tiny larvæ wander over the bark, ultimately settling down to feed by inserting into the bark their sucking mouth parts. In this larval stage there is practically no sexual distinction. A secretion is given off which covers the larva, and later the first moult takes place and the second stage is attained. The

moulted skin is not thrown aside, but remains to form part of the shield or covering of the insect, this covering being greatly added to and completed by secreted matter. This second stage is a quiescent one, but the insect anchored by its mouth parts continues to suck up the sap. It is important, from the standpoint of treatment, to note that it is in this second immature stage, complete by the autumn, that hibernation takes place.

About the beginning of the next April, the second stage males pass into the pupal condition, and, after a pupal stage of three weeks, the pupal skin is cast and, in suitable sunshiny weather, the adult males emerge. This last cast skin is to be found for a time at the hind end of the scale. Meanwhile the second-stage females—not really differing much from the future adult females—have accomplished their last moult and become adult. The adult females are sought by the male, and pairing takes place, followed later by the laying of the eggs.

TREATMENT.—(1) All young stock infested should, before being sent out for planting, be fumigated with hydrocyanic acid gas. The form in which *Aspidiotus ostreæformis* is found on plants in winter is one to which this poisonous gas will prove fatal.' (See Leaflet No. 188.)

(2) Infested plants, in the open, should be sprayed in winter with the winter wash recommended in Leaflet No. 70.* A strong paraffin emulsion would kill the scale insects if it reached them. One would be guided by circumstances, noting whether or no the trees had on them a growth of lichen or moss, and remembering also that *A. ostreæformis* is a scale which sticks very closely to the bark, and that the external layers of the affected stem may, to some extent, protect the scale.

R. STEWART MACDOUGALL.

---

* The wash given in the revised edition (which is about to be issued) is composed of 2 gallons of paraffin, 1½ lb. of soft soap, 6 lb. of caustic soda, and 28 gallons of water. The soft soap should first be dissolved in 1 gallon of boiling water and to this the paraffin should be added and the mixture thoroughly churned until a cream-like emulsion results. (The thorough churning is important). The 6 lb. of caustic soda should then be dissolved in the remaining 27 gallons of water and the emulsion added; the whole being well churned. The soft soap and paraffin emulsion wil keep satisfactorily for some time, but the complete mixture should be used at once.

The Elm Bark Beetle.

A severe attack of the Elm Bark Beetle (*Scolytus destructor* Olivier) has occurred on the estate of the First Garden City at Letchworth, Herts. About 50 elms have been attacked on various parts of the estate, the species in each case being *Ulmus campestris*. The beetle was first noticed at work about three years ago, and since that time it has spread considerably. Several trees, apparently in perfect health twelve months ago, are now practically dead. In such cases the holes made by the beetles can be seen all over the bark. Trees which have been freshly attacked this year show the presence of the beetle, even at a distance, by the leaves on certain branches turning yellow. Some of the trees, which are on a sandy soil, show the effect of the beetle by losing their bark, which falls from the base of the trunk, but those on clay show no sign of their bark peeling.

Dr. R. Stewart MacDougall has furnished the Board with the following report on this beetle :—

" The large Elm Bark Beetle (*Scolytus destructor* Olivier) is a very dangerous enemy of the elm. It attacks young and old trees alike, and has now and again been the cause of the destruction of many elms. The chief damage is due to the tunnelling of the grubs.

" *Life History*.—In very favourable conditions of weather on the Continent, it is believed that two generations in the year are possible. The same has been stated as possible in Britain, but there is no experimental proof of this. Typically one generation in the year is found. The adult beetles issue in May or June, according to the position (north or south) and to the weather conditions. Egg-laying follows, and the grubs from the eggs bore their galleries between the wood and the bark, the wood not being markedly tunnelled if the infested part of the tree has thick bark. By the end of July or in August many larvæ may be full grown, and it is possible that some pass on to pupation in time to admit of the exit of the adult in the same autumn. More commonly, however, pupation is delayed until the next April or May, the beetles issuing in May or June.

" *Treatment*.—1. Where a tree is badly infested it should be felled and the bark removed. The infested branches

and the bark should be burned. Where the bark is very thin it should be remembered that at such places the wood will have been bored to a greater extent. If such badly infested trees are allowed to stand they act as centres of infection. According to the life history given above such felling and barking should take place in late July or early in August, before the issue of the brood.

"Felled healthy elms should never be allowed to lie unbarked. The Elm Bark Beetle lays very willingly in such felled trees, hence a measure which is sometimes practised against the Elm Bark Beetle in cases where many trees have not been attacked, is to use such felled trees or thick branches as traps, always taking care that the traps be visited and removed before the beetles bred in them have become adult and have issued.

"2. The rough outer bark where the insects are known to be at work should be shaved off by means of a spokeshave. The foundation for this treatment arises from a practice in France and elsewhere of paring off the outer bark of apple trees that are bark bound in order that their vigour may be restored. A French experimenter, M. Robert observed (*Gardeners' Chronicle*, 1848) in connection with *Scolytus* larvæ that they failed to complete their development if they were not protected from the drying influence of the air, or if their burrows overflowed with sap. These observations led him to practice against the Elm Bark Beetle, the 'removal of all the superficial portion of the bark, *i.e.*, all the corky portion.' The grubs in the trees so treated perished, and the new bark was too thin for the adult beetles to choose it for egg-laying. So satisfied was M. Robert that he extended his treatment, and with justification, to more than 2,000 elms.

"3. Young trees may be protected against the adult beetles by smearing them with tar or cow-dung or lime. A smear used in Germany for this purpose, known as Leinweher's composition is made up as follows:—5 lb. of tobacco mixed with half a pailful of hot water and kept hot for 24 hours; the water squeezed out of the tobacco is mixed with half a pailful of bullock's blood, one part of slaked lime and sixteen parts of cow-dung. This is kept in an open tub, stirred once a day and used after fermentation has set in to paint the

tree, after removal of moss and the rough bark, for three successive days till a crust is formed. If such a smear be used it should be remembered that it will not act as a deterrent to boring by the adult beetle unless it is laid on some millimetres thick."

Mr. Cole, Forester at Letchworth, has also supplied the following report on the steps taken by him to destroy the beetle :—

"When I first commenced work at Letchworth, I noticed a bad attack of *Scolytus* in Spring Wood. The worst of the trees were at once taken out and destroyed. Three years ago, I noticed many trees on the exposed side showed signs of disease and I commenced to take out the affected limbs. Acting on experiments I had seen in Central and Western Europe, I also endeavoured to cause a sudden flow of sap and thus drive out the beetles. This flow was encouraged by severely pruning the lower limbs and dressing the wounds to prevent bleeding, and on the trees thus treated it was noticed that the burrowing females were driven to the entrance of their burrows and were forced to remain there owing to the flooded workings. Whilst in this state they fell an easy prey to the common wasp which swarmed over the trees, dragged out the beetles and devoured them. The wasps were so plentiful that I had many complaints of wasp nests in the trees. The larvæ were trapped in their own burrows, being unable to return owing to the early part of the burrows being too narrow for their increased size. Examination of larvæ thus entrapped showed them to be a dull iron red and surrounded by a viscid substance which proved to be partly sap and partly a secretion from the larvæ. The secretion was unlike that usually met with at this stage.

"The summer of 1906 was very dry here, and, added to this, the sub-soil was drained by the cutting of sewers, gas and water mains, &c. Where the soil has been thus drained, making it in consequence impossible to keep the burrows flooded, pupation took place and the beetles returned to the weakened trees and killed them.

"By carefully caging portions of affected bark I found the beetles came to the surface in June and commenced to burrow again within three days. By cagings on young and vigorous

elms, I found they were driven back by the sap as soon as they reached the cambium layer, they fed for some time on the outer bark and then died.

"A dozen caged on an old apple tree burrowed and came to a torpid state but did not lay eggs. They refused to touch young apple trees. The species does not seem able to enter *Ulmus montana*.

"Trees that were taken down were cut up for firewood. The heaps that remained unsold were freely sprinkled with paraffin and limewash. In a plantation of old elms that were treated by severe loppings, I have a few good butts lying as traps. These are now full of burrows and will be barked during the coming winter. Autumn broods are an exception here. In the autumn of 1906 I noted a few in September, but this autumn I have found none on the surface."

Notes on Insect, Fungus, and Other Pests.*

Destroying Garden Pests.—For the destruction of slugs, woodlice, small beetles and some other pests in gardens, a correspondent informs the Board that he has found the use of earthenware and other jars with narrowish necks very valuable. The method is to sink the jars in the soil until the tops are flush with the surface. In the bottom of each jar is placed a couple of inches of strong brine, while the necks are smeared with sticky sweet material—treacle, moistened sugar, or butter, or a mixture of the two latter boiled down and thickened. If the jars are examined once a week, especially where pests are numerous, many noxious insects, &c., will be found trapped. The jars may be moved from place to place in the flower garden, while in the kitchen garden old soft-soap tins, &c., may be utilised in a similar manner. The correspondent remarks that during last summer he sank ten jars in a rockwork about 70 ft. long and on taking up the jars about ten days later, he found that a quantity of vermin of all sorts had been trapped.

The Goat Moth.—From Buckhurst Hill (Essex) came an inquiry as to the saving of an oak tree attacked by the

* Notes on insect, fungus and other pests, dealing with the specimens submitted to the Board for identification, and their apparent prevalence, will appear in this *Journal* month by month. The notes commenced with the issue for June, 1907.

caterpillars of the goat moth (*Cossus ligniperda*). As recommended in the Board's Leaflet No. 60, trees infested with these caterpillars should be cut down and the brood destroyed. If allowed to stand infested trees are a danger to surrounding uninfested trees. Where a tree is not badly attacked, however, and where it is especially desirable to save the tree for ornamental or other purposes, an endeavour may be made to destroy the caterpillars. The openings of the larval galleries should be found, and into each should be pushed as far as possible a small piece of cyanide of potassium (a dangerous poison). If the openings are then plugged up with clay the fumes from the cyanide will kill the caterpillars. The protective measure (No. 4) on p. 7 of the leaflet should be adopted in the case of neighbouring unaffected trees.

Carnation Fly.—Carnations attacked by the maggots of a fly, apparently *Hylemyia nigrescens*, were reported from Ipswich. This pest is extremely difficult to combat, the only measures practised hitherto with any success being of a preventive character. For example, finely powdered soot or lime may be scattered over the plants when they are wet with dew; this may prevent egg-laying by the flies. A mixture of soot and lime in the proportion of 1 bushel of lime to 3 bushels of soot may also be used. Egg-laying may also be prevented by spraying the plants with a paraffin and soft-soap emulsion, or carbolic acid and soft soap, as stated in the Board's Leaflet No. 35 on the celery fly. Growers have found the carnation fly a very troublesome enemy, and some believe that mixing soot with the soil previous to layering acts as a preventive.

Mites.—Specimens of the bark of plum trees received from St. Ives (Hunts) were found to bear the eggs of the beetle mite *Oribata lapidaria*, an account of which was given in this *Journal* for May, 1907, p. 108.

Black currant bushes attacked by mite were reported from Leighton Buzzard and Reigate.

Diseased Kohl Rabi.—Specimens of kohl rabi received early in November from near Amesbury, in the valley of the Avon, were affected in a peculiar way, the thickened base of the stem being branched and malformed. The crop was grown on good loamy soil containing a sufficiency of lime, lying at the foot of the

chalk downs, and on which "Anbury" or "Finger-and-Toe" is unknown. Quite 75 per cent. of the crop was affected. The branching and malformation of the thickened base have been caused by the arrest of the growth of the primary stem. As a result the swollen base became branched, each branch producing a tuft of leaves. No "Anbury" or other fungus parasite was present. It is impossible to say what was the cause of the arrest of the growth of the first crown of leaves, but in the majority of instances it is due to the work of an insect early in the season. The Board have been informed that "the plants did go off a bit after they were visible" early in the season, and when they were seen in the rows "they hardly moved for three weeks." This points in the direction of the turnip fly or some other insect that attacks the plant about the same stage.

Diseased Honeycombs.—From near Holmwood (Surrey) the Board received between the end of October and early in November several specimens of honeycomb for examination. One specimen showed undoubted traces of foul brood (Leaflet No. 32). In another comb the fault appeared to be chilled and mildewed brood, an indication that the stock was a very weak one, and unable to make its way in the untoward conditions prevalent during the season of 1907. The same comb showed evidence of the ravages of the wax moth. In regard to a further specimen, the Board were advised that the loss of the stock was apparently caused by starvation. The cells were very dry and did not seem to have been occupied for a considerable time. The bees should have been supplied with food during the breeding season when outside nutriment was unavailable, as in the past season.

Abnormal Tomatoes.—Tomatoes forwarded from Melrose showed scattered hard green patches which refused to ripen. This condition of things has been proved to be due to a lack of potash in the soil. Sulphate of potash, crushed and sprinkled over the soil at the rate of 1 oz. per square yard (say $2\frac{3}{4}$ cwts. per acre), has proved beneficial.

Diseased Gooseberry Shoots.—Specimens of gooseberry bushes from Maidstone were found to bear minute black dots scattered over the shoots. These dots were the micro-sclerotia of *Cladosporium epiphyllum*, Fr, a saprophyte growing

on the cortex that is shed annually in Ribes. When the cortex has fallen the micro-sclerotia produce spores, and these in turn infect the cortex of the succeeding year. *C. epiphyllum* occurs on practically every Ribes shoot. Other dots scattered here and there represented *Phoma grossulariae*, Sacc., and other saprophytic forms on the deciduous cortex.

Report of the Intelligence Division.

The report by Mr. T. H. Middleton on the work of the Intelligence Division of the Board of Agriculture [Cd. 3869] contains an account of the action taken by the Board during the year 1906 under the Sale of Food and Drugs Acts, 1875 to 1899; the Merchandise Marks Acts, 1887 to 1894; the Fertilisers and Feeding Stuffs Act, 1893; and under Section 2 (Sub-section 3) of the Board of Agriculture Act, 1889.

The administration of the Sale of Food and Drugs Acts, so far as they relate to agricultural produce, forms the first section of the report. Information is given as to the number of samples taken and the cases of adulteration which were ascertained. Numerous complaints of the state of the law as to the sale of milk were received, and the various suggestions, made with a view to the protection both of the sellers and the public, are discussed in the report, as well as other points which arose in the course of the year in connection with the sale of butter, margarine and cheese.

The steps taken by the Board to assist farmers in connection with the carriage by rail of agricultural produce are described, and numerous instances are given in which the intervention of the Board has been attended with satisfactory results.

It is mentioned that the Board are prepared to carry out, so far as they can do so consistently with their present statutory powers, and so far as the staff at their disposal will allow, the suggestions contained in the Minority Report of the Departmental Committee on Railway Rates and Facilities. They will inquire into complaints on preferential rates and assist agriculturists to ascertain whether any preference that may be found to exist is an undue or illegal preference.

The Board would be prepared to deal with cases of alleged preference to traffic between urban districts as compared with traffic from rural districts, in the same way as with cases of

alleged preference to imported traffic. There is generally direct competition between railway companies and shipping and canal companies for traffic from ports to urban centres and from one urban centre to another, whereas for the traffic from rural districts to urban centres there is often no direct competition, and agriculturists appear to think that this fact, together with the importunity of the great trading corporations of large towns, has had and will have the effect of causing railway companies generally to devote an undue proportion of their attention to the development of the traffic of their competitive and main routes.

Another section of the report is devoted to a consideration of the recommendations of the Departmental Committee on Fruit Culture, and an explanation is given of the extent to which it has been possible, up to the present, to give effect to them, as well as of the directions in which it is hoped action will be taken in the future.

The report concludes with a description of the general work of the Division, and of the information which it has been possible to communicate to the public through the medium of this *Journal* and of the Leaflets. The total number of leaflets sent out was 916,000, and 20 new leaflets were issued. The sale of the bound set of the first 100 leaflets and of the sectional volumes was well maintained; 3,062 copies of the former and 28,721 copies of the latter were disposed of in the course of the year.

Supplement to the Journal.

A report on agricultural education in the United States, which has been prepared by Mr. Esme Howard of the British Embassy, Washington, is issued as a Supplement to the present number, price 4*d*. post free. Subscribers to the *Journal* can obtain this report for 3*d*.

The American Gooseberry Mildew Order of 1907.

By the American Gooseberry Mildew Order of 1907, which came into operation on the 14th December, 1907, the previous local Orders were revoked and this new Order made applicable to all the counties and boroughs which had been declared infected up to that date. These were the Administrative Counties of Gloucester, Worcester, Warwick, Cambridge, Huntingdon, Isle of Ely, Lincoln (Parts of Holland), Norfolk, Derby, Leicester, Nottingham and Hereford, and the Boroughs of Bristol, Gloucester, Cheltenham, Worcester, Kidderminster, Birmingham, Coventry, Royal Leamington Spa, Warwick, Cambridge, King's Lynn, Derby, Leicester, Nottingham and Hereford.

The principal provisions of the Order are as follows:—

Notification of Disease.—The occupier of any premises on which there is a bush which is diseased or suspected of being diseased is to notify the fact to the clerk to the Local Authority.

Preliminary Investigation by Local Authority.—The Local Authority on receiving notice of the existence or supposed existence of disease shall cause a notice to be served on the occupier of the premises which shall thereupon become "infected premises."

The notice shall as far as practicable include in the infected premises only such plantations, gardens or fields as contain bushes which are or recently have been diseased.

Precautions to be Adopted in case of an Outbreak of Disease or Supposed Outbreak.—The occupier of any plantation, garden or field on which there is a diseased bush is to spray as soon as is practicable all the diseased bushes and all gooseberry and currant bushes on the plantation, garden or field to which the disease is likely to spread with a solution of liver of sulphur (containing not less than one pound of liver of sulphur to thirty-two gallons of water) or with some other fungicide approved by the Local Authority for that purpose; but this provision does not apply to bushes which have shed their leaves.

No bush shall be removed from any plantation, garden or field on which there is a bush which is diseased or suspected of being diseased, and clippings from diseased or suspected bushes shall be forthwith destroyed by burning or other effective method.

Action to be taken by Local Authority after Preliminary Investigation.—The Local Authority is to cause a notice to be served on each occupier of infected premises requiring him as regards each diseased bush on the premises and every bush immediately adjoining such bush—(*a*) to destroy by burning or other effective method either the whole bush or, if the occupier so prefer, all wood formed in the current or preceding year, which wood shall be pruned to the satisfaction of an Inspector of the Local Authority, and also similarly to destroy the fruit (if any) on each diseased bush; and (*b*) to spray thoroughly the site of each bush which has not shed its leaves with a solution of liver of sulphur (containing at least one pound of liver of sulphur to twenty-four gallons of water) or with some other fungicide approved by the Local Authority.

If the occupier fails to carry out the destruction, the Local Authority may cause their officers to carry out the work. The occupier must also, when directed by an Inspector of the Local Authority, prune or spray all gooseberry and currant bushes on the infected premises whether the same have been diseased or not.

All clippings arising from any pruning shall be forthwith destroyed by the occupier by burning or other effective method.

Power to Require Adoption of Precautions on Premises in Vicinity of Infected Premises.—The Local Authority may cause a notice to be served on the occupier of any plantation, garden or field to which the disease is likely to spread from infected premises requiring such occupier to spray thoroughly all the gooseberry and currant bushes on such plantation, garden or field.

Precautions against Spread of Disease by Fruit Picking.—Where the Local Authority are satisfied that the extent of the disease in any plantation, garden or field is such that the picking of the crop would be likely to spread the disease to other premises, the Local Authority may prohibit the picking of the crop.

Precautions against Spread of Disease by Bushes.—No gooseberry or currant bush is to be removed from infected premises except with a licence granted by the Board.

Powers of Entry.—Any Inspector or other officer appointed in that behalf by the Local Authority, and any Inspector of the Board, may, upon production of his appointment or authority, enter any land on which he has reason to believe that disease exists or has recently existed and examine any gooseberry or currant bush on such land.

Offences.—Non-compliance with the Order renders persons liable on conviction to a penalty not exceeding ten pounds.

Notes on the Weather in December.

During the *first* week of December the weather was very unsettled throughout the whole of the Kingdom. Rain was frequent and at times heavy, while the many transitions from rain to clear or partially clear sky were often very rapid. Some snow fell in the north. Temperature was above the average in most of the English districts, in England S. it was "unusual," and only in England N.E. and N.W. "deficient." Rainfall was "heavy" or "very heavy" in every part of Great Britain except England N.E., where it was "moderate," while sunshine was "abundant" or "very abundant" everywhere except in Scotland W. In several places frosts on the grass were reported every night. During the *second* week the weather was generally rough and very unsettled, and rain unusually frequent and heavy. Thunder was heard and lightning seen at several places. The temperature was above the average, being "unusual" in England E., S., N.W. and in the Midlands. The rainfall was "heavy" everywhere except in Scotland W., where it was "moderate." In England E., S., S,W. and in the Midlands it was "very heavy." Sunshine was, however, "abundant" in the first two districts. Night frosts were less frequent than in the first week. During the *third* week over the eastern half of England and in a few localities towards the west a considerable part of the week was fair although not at all bright, but in the western and northern districts generally the conditions were very unsettled, a measurable quantity of rain falling almost every day. Temperature exceeded the average to the extent of more than 4° generally and more than 6° in the Midland counties, being "unusual" throughout the whole of the United Kingdom. Rainfall was "light" in England S. and E. and in the Midlands. In Scotland it was "heavy." Sunshine, as a rule, was "scanty." During the *fourth* week of December the weather was somewhat rainy in most parts of the Kingdom, becoming drier towards the end of the week. The atmosphere was unusually dry at the end of the week, the rainfall being deficient in most places. Bright sunshine was below the average in many places. The percentage of possible duration ranged from 20 in England N.W. and 17 in Ireland S. to 4 in the Midlands. At Birmingham the week was quite sunless.

With this week, except for a few days, the year 1907 came to an end. It was remarkable for its ungeniality and cheerlessness except for a few weeks in the autumn, for the coldness of the summer and the warmth of the autumn. During the summer, England N.E. and S. and N.W. experienced 8 weeks of less than average warmth, England E. and the Midlands, 7, but in the autumn, England N.E. had 9, England S., 7, and England N.W. 6 weeks of more than normal warmth. The accumulated number of day degrees of temperature above 42° F. fell in many cases below the average of the last 25 years, especially in England S.W., where not only was there a deficiency of 246 degrees above 42° but also an excess of 35 below 42°. The total rainfall for the year did not, however, vary very much from the average. There was an excess in inches of 1·14 in Scotland E., 2·34 in the Midlands, 2·88 in Scotland W., 1·84 in England N.W., 2·37 in England S.W., while there was a deficiency of 0·43 in England N.E., 2·81 in England E., 0·30 in England S. In the matter of sunshine, England E., N.E. and S. alone recorded more hours than the average for the last 25 years, namely, 37 in each case. Other places recorded a deficiency, which in the case of Scotland W was as much as 113 hours.

Very few observations were made by the Board's correspondents in the month of December. In Berkshire the lambing began at the end of the month, and the ewes and lambs were reported healthy. The heavy rain and floods not only did much damage, but prevented threshing so that straw was scarce, but towards the end of the month this was overcome. In the east of Scotland ploughing was reported as progressing well and the weather was described as passable. A larger number of wild fowl and pigeons were noticed. In the west, sheep were said to be losing condition through want of dry beds in the early part of the month.

Notes on Crop Prospects Abroad.

Russia.—The Board are informed, through the Foreign Office, that the Central Statistical Committee of the Ministry of the Interior, has published the preliminary returns of the winter-sown grain crops of Russia for the year 1907. According to these returns it would appear that the total yield this year of winter-sown rye in the seventy-two provinces and regions of the Empire is estimated at 19,699,209 tons, and of wheat at 4,343,387 tons. In 1906 the corresponding figures were 16,280,000 tons of rye and 6,391,451 tons of wheat. It would appear from this that the quantity of winter-sown rye harvested in 1907 was in excess of the total given for the previous year by about 21 per cent., while the yield of wheat during the same period shows a diminution of 32 per cent.

Later returns issued on 16th December by the Central Statistical Committee give also the figures for the spring-sown grains. From this statement it appears that the yield of winter wheat in the seventy-two governments was 20,197,000 qrs. and of spring wheat 43,425,000 qrs., making a total of 63,622,000 qrs. compared with 63,105,000 qrs. in 1906. The yield of barley is put at 42,300,000 qrs. compared with 37,350,000 qrs., and of oats at 95,000,000 qrs. as against 73,500,000 qrs. last year.

Saskatchewan.—According to a memorandum by the Provincial Department of Agriculture of Saskatchewan the area sown with wheat was 1,848,000 acres compared with 1,731,000 acres in 1906. The weather at sowing time and during the greater part of the growing period was unfavourable, and the total yield was only 28,000,000 bushels compared with about 37,000,000 bushels in 1906. There was very great variation in the results obtained from different areas, and in regard to this point some interesting remarks are made. It is observed that in earlier years, when the production of grain was confined to a limited area, there was a more or less constant danger of a serious failure of the crop. Owing to the fact that settlement was not very widely distributed, the soil presented comparatively uniform features. Modern methods of cultivation had not been extensively adopted, so that the uniformity of conditions increased the liability of a general visitation of any of the destructive influences feared by the farmer in former days.

Conditions at the present day are different in many respects from those of even a few years ago. Agricultural operations have been extended to many new districts, and the area of the districts now partly under cultivation is over 73,000,000 acres. It is evident that in this large expanse of country, there is much less liability to a general failure of the crop. The varied character of the soil, the improved methods of cultivation, the scattered areas of tilled land, and the complexity of weather conditions peculiar to such a large territory, all tend to reduce to a minimum the probability of anything like a general failure.

In the past season, the oat crop amounted to 29,168,000 bushels from 772,770 acres, being the largest on record. The average yield was 37¾ bushels per acre, a figure which has only been exceeded on two previous occasions. Barley is but little cultivated, but the yield of 30 bushels is higher than in any year since 1901, when about 31½ bushels were obtained. The total production in 1907 was 1,903,000 bushels from 60,261 acres.

United States.—According to the December Report of the Department of Agriculture, the newly-seeded area of winter wheat is estimated at 31,069,000 acres, a decrease of 2 per cent. compared with the similar area in 1906.

South Australia.—The Board of Trade correspondent at Adelaide (Mr. J. Cresswell) reports, under date of 31st October, that the wheat harvest is estimated to return 15,000,000 bushels against 21,000,000 bushels last year. It is anticipated that the whole of the surplus supplies will be absorbed in Australia. The hay crop will be light and prices will run high. Wool is fetching good prices, and sheep-farming generally is in a prosperous condition. The fruit crop is expected to be a good one. According to *Beerbohm's Corn Trade List* (29th November) the preliminary official estimate of the wheat crop is 15,782,000 bushels.

The Board have received, through the Foreign Office, the following memorandum dated December 16th, 1907, by Mr. Consul-General Schwabach on the fruit and potato crops in the consular district of Berlin :—

Fruit and Potato Crops in Germany.

The dull and rainy weather which prevailed in 1907, in North Germany throughout the summer gave rise to most unfavourable prognostications with regard to the ultimate extent and quality of the fruit and potato crops. But a sudden change in the weather about the middle of September—when an unusually warm temperature, accompanied by unclouded summer sunshine, was experienced—caused a more hopeful view of the prospects for the harvest to be taken, although expert opinions vary greatly as to the probable yield of garden and field fruit. For this reason it is impracticable to express a definite opinion until the entire harvest has been gathered in.

Fruit Harvest.—This year's fruit harvest in the Province of Brandenburg may be designated a fairly average one, the quantity being slightly greater than that of last year. The total harvest of apples, pears, plums, cherries, gooseberries, and currants is computed at 50,000 tons, but, as far as can be ascertained up to the present, no appreciable quantity thereof will be available for exportation to the United Kingdom, as growers are finding a ready market for their produce in Berlin.

In the Province of Saxony there was a good yield of cherries, gooseberries, currants, and pears, a fairly good harvest of apples, but an indifferent one of plums. Most of the hard, late cherries—of which large quantities were exported to England in former years—burst when nearly ripe owing to the continued heavy rains. With the exception of sweet and sour cherries, gooseberries, currants, and pears, the produce of which has been, generally speaking, very satisfactory, this year's harvest of most kinds of fruit is considered to be inferior to that of the preceding year.

The prices ruling at Berlin—the most important fruit sales centre in Germany—are shown in the tables on the next page.

Potato Crop.—In the Provinces of Brandenburg and Saxony this year's potato crop was worse than in 1906, although the crops from the lighter soils are said to have been satisfactory. Exports to the United Kingdom will probably not be so considerable as they were last year, as, owing to the total failure of the potato crops in East Prussia, it is expected that large quantities will be required for consumption in that province.

In spite of the damp and cold weather, the potato crops in the Duchy of Anhalt and the Principalities of Schwartzburg seem to have been of the same quality and quantity as those of the preceding year. The total production is estimated at 500,000 tons, an abundance likely to allow of some exportation to England. The following table shows the average prices at the more important centres.

AVERAGE Prices of Edible Potatoes in Marks per 1,000 Kilos. (2,204 lb.).

Month.	Berlin.	Magdeburg.	Halle-on-Saale.
January	45·9	57·5	55
February	80	76·6	71
March	49·9	62·5	55
April	51·8	65	61·3
May	62·3	65	71·7
June	71·4	72·2	78·8
July	86·9	73·1	89·2
August	56·5	51·4	62·6
September	56·3	49·7	60·8
October	56·8	61·4	60
November	59·5	63·3	65

PRICES in Marks per 50 Kilos. (= shillings per 110 lb.).

Month.	Apples.		Pears.	
	Description.	Price.	Description.	Price.
End of July	Italian	14–33	Italian ...	13–35
End of August	Italian	8–17	Italian ...	20–25
	Local	6–12	Local ...	5–16
	Gravensteiner 2nds	35–45	Tyrolian ...	35–45
	Tyrolian	45–50	—	—
End of September ...	Italian	8–12	Italian ...	7–12
	I quality	10–25*	Local ...	3–25
	II quality	4–10*	Tyrolian ...	10–35
	Tyrolian	15–45	—	—
End of October... ...	Cooking	5–8	Edible 1sts...	8–13
	Italian	8–12	Local ...	4–10
	Local	5–12	Cooking ...	5–8
	Gravensteiner 1sts	20–25	Tyrolian ...	10–25
	Gravensteiner 2nds	10–15	—	—
End of November ...	Cooking	5–10	Edible 1sts...	18–25
	Italian	10–11	Edible 2nds	10–17
	Local	15–25	Cooking ...	5–8
	Tyrolian 1sts ...	18–26	—	—
	Tyrolian 2nds ...	12–18	—	—
December (1–11) ...	Local 1sts	10–20	Italian ...	25–30
	Local 2nds... ...	5–10	—	—
	Italian 1sts ...	10–20	—	—
	Tyrolian 1sts ...	20–40	—	—
	Tyrolian 2nds ...	16–20	—	—

* Local.

PRICE in Marks per 50 Kilos. (= shillings per 110 lb.).

Fruit.	End ot July.	End of August.	End of September.	End of October.
Cherries—				
Sweet	18–35	—	—	—
Sour	15–24	15–20	—	—
Currants	7–10	—	—	—
Gooseberries	8–12	—	—	—
Egg plums—				
Bühler	—	25–27	—	—
Local	—	—	3–7	10–16
Plums—				
Italian	14–20	12–14	—	—
Bohemian	—	—	—	12–18
Greengages	—	15–30	—	—

Winter fruit is finding a ready market at remunerative prices in Germany, and therefore exports will in all probability be restricted to a mimimum quantity this year. In the Duchy of Anhalt and in the Principalities of Schwartzburg-Rudolstadt and Schwartzburg-Sondershausen, which are of minor importance as regards exports of fruit to the United Kingdom, the fruit harvest was satisfactory.

Miscellaneous Notes.

Importation of Seeds and Plants into Portugal.—The Board are informed that plants and shrubs for importation into Portugal must be accompanied by a certificate of origin, duly legalised, certifying that the locality from which they come is free from *phylloxera* in either a sporadic or epidemic form. Such a certificate, however, is not requisite in the case of seeds.

"Bolting" in Turnips, &c.—Premature running to seed, or "bolting," in turnips, carrots, cabbages, &c., was extremely common last year, more especially in Scotland. It is the result of a check, followed by conditions very favourable to growth. The check may be due to drought, cold, &c.; and there is no proved connection between the quality of the seed and "bolting." There was some fine growing weather in July, and then a cold, wet August, during which the tendency to seed developed. This tendency seemed to be increased by the subsequent fine weather in September.

Destruction of the Fruit Fly in Bermuda.—The Board have received through the Colonial Office a report on the work carried out in Bermuda under the Fruit Fly Destruction Act, 1907, with a view to the eradication of the Mediterranean fruit fly (*Ceratitis capitata*). The propagation of the species, it may be noted, depends on the mature female fly finding suitable fruit in which to lay eggs. If the eggs are deposited in fruit that is too young, the maggots hatch before the fruit is in a condition to serve as food, while if it is too ripe the maggots also fail to survive, as it needs for its development the interior of a growing fruit. The plan adopted, therefore, was to destroy all the mature fruit of the kinds known to be attacked throughout the island. Where trees bearing a large number of small fruit were too numerous, they were pruned back to prevent them producing fruit in the next season. The fruits were collected in sacks, and either burnt, boiled or thrown into the sea. Very little opposition was offered by owners of fruit trees, and the result obtained after one season's work was very satisfactory. Comparatively few flies were found, and confidence was expressed in the possibility of exterminating the pest.

Exports of Agricultural Produce from Brittany.—Referring to the establishment of the new Brest-Plymouth steamship service, the British Vice-Consul at Brest (Mr. S. S. Dickson) draws attention, in a recent despatch, to the opportunities for trade which this new service has been the means of creating. He remarks that the Department of Finistère, not to speak of the rest of Brittany, is specially adapted for agricultural and farm produce. Isolated, however, from the main lines of commercial enterprise, the extent of its resources has not, so far, been realised, and it remains a negligible quantity as an exporter of farm produce. Lack of organisation it appears is the immediate cause, but this is subsidiary to the real cause, which is isolation from the only possible market. The produce of Finistère is not in demand in the neighbouring departments, which supply more than sufficient for their own needs. The market of Great Britain has hithterto been inaccessible owing to the want of a suitable means of transport. This difficulty has now been overcome by the opening of the new Plymouth-Brest route. (*Board of Trade Journal*, 14th November, 1907.)

Trimming of Hedges.—In the article on the subject of "Fences and Hedges," which appeared in this *Journal* for May, 1905, no reference was made to the best time for pruning hedges. Hedges which are well cared for and regularly dealt with may be trimmed in January or February if they are in exposed situations, or at any time during the season from August to February if sheltered. In the case of neglected hedges, however, hard pruning is required, and they should be taken in hand in autumn in ordinary situations in the Eastern Counties, or in early spring in cold, exposed positions. The whitethorn is very hardy, but may suffer if severe frost follows soon after pruning.

Dewponds.—A writer in the *Estate Magazine* (November, 1907) compares the construction of dewponds, or "meres" as they are called, in the Peak of Derbyshire with those made elsewhere. (See *Journal*, November, 1907, p. 498, and June, 1906

p. 181). The main difference is that no straw is used. The lowest layer is formed of dry lime, quicklime if possible, to prevent roots passing upward through the lining. The thickness is about 3 in. On this is laid about 1 in. of fine gravel, and a bed of about 9 in. of well-tempered clay forms the water-tight lining. It is covered by 2 in. or 3 in. of gravel, on which is laid stone pitchers. The joints of the stones are carefully filled with gravel, and the "mere" is complete. It is stated that there are dozens on the hills, and that they appear to be efficient.

State Assistance to the Poultry Industry in France, Belgium and Denmark.—The Board have received through the Foreign Office some information obtained by Consuls with regard to the assistance afforded to the poultry industry in several foreign countries.

No subventions are given to model poultry farms in France, but there exists a Government Poultry School at Gambais. This school, besides giving instruction in poultry-keeping to young farmers, &c., is intended specially to train men qualified to undertake the management of poultry farms which will serve as examples to other farmers and as centres for the encouragement of the poultry industry. Three courses are given annually, each extending over three months, male and female pupils being received at alternative courses. The charge for instruction, including board and lodging, is £14 for the period of three months. Two lectures are given weekly, while the rest of the time is devoted to practical instruction in incubation, breeding, fattening, packing, marketing, &c.

No other special encouragement is given to poultry-keeping, but this industry shares with other branches of agriculture the advantages afforded to societies in the way of prizes, loans, &c. Some of the railway companies have granted special rates for poultry.

Apart from some educational facilities, very little is done for the poultry industry in Belgium. Subsidies are given to poultry societies amounting to about £400 a year, and a few provincial societies distribute pure-bred stock and sittings of eggs, but the practice has not proved successful. A sum of about £220 is granted each year by the State for the purpose of giving lectures to farmers on questions relating to poultry. These lectures are free, and are arranged for locally by the poultry societies as provided in the Regulations of the Department of Agriculture. Courses in poultry-keeping are also given at the agricultural schools. A large number of exhibitions are organized annually by poultry societies, and the State bears one-third of the cost.

A sum of £666 was granted by the Danish Government in 1906–7 for the development of poultry-keeping. This amount is distributed amongst three societies, who have altogether 8,000 members. These societies arrange the distribution of pure-bred stock and sittings of eggs to the members who are generally people of small means in the country. The societies issue fortnightly periodicals to their members, and each of them keeps an instructor. The State grant was formerly £500, but has been increased owing to the growth of the industry. As regards transport, eggs are carried by express trains at the rate charged for slow trains.

Agricultural Machinery in Bulgaria.—H.M. Vice-Consul at Sofia states that a considerable quantity of British machinery for agricultural purposes was imported in 1906, and, as the State now helps the peasant to purchase up-to-date machines for reaping, threshing, &c., by making him advances on his land, produce and stock, it may be hoped that there will be a still greater demand for this class of goods from the United Kingdom. (*Board of Trade Journal*, 28th November, 1907.)

Importation of Hams and Bacon into Brazil.—H.M. Consul at Santos (Mr. R. Casement, C.M.G.) reports that hams are imported into that port chiefly from the United Kingdom, and that an opening certainly exists for the extension of this trade, wherein Irish dealers might profitably share. So, too, with bacon, which at present is chiefly imported from the United States. There is, adds the Consul, a distinct want of food-stuffs of this kind in Santos and São Paulo. (*Board of Trade Journal*, 28th November, 1907.)

Agricultural Statistics, 1906.—The fourth part (Cd. 3832, price 5½*d.*) of Volume XLI of the annual Agricultural Statistics published by the Board of Agriculture and Fisheries comprises particulars, in continuation of those given for many years past, of Colonial, Indian and Foreign Agriculture, and also contains, for the first time, tables relating to the official prices of agricultural commodities in certain countries. Statistics for Great Britain, Ireland and the United Kingdom respectively, compiled as nearly as possible on the same plan as those given for the Colonies and foreign countries, are also included in this part of the report, together with an index to the whole volume.

Prohibition of the Export of Barley from Turkey.—The Board of Trade are in receipt, through the Foreign Office, of information to the effect that the export of barley from any part of the Turkish Empire has been prohibited. (*Board of Trade Journal*, 28th November, 1907.)

Growing Mangolds close together.—A system of growing mangolds close together has been adopted with satisfactory results on the sewage farm of the Reigate Corporation. This farm was formerly used for the disposal of crude sewage, but is now only watered by the effluent from sewage beds, worked on the "sprinkler" system. The sewage is purified bacterially to the extent of 99 per cent., only a small percentage of harmless salts being left in it. The system is to plant the mangolds in double rows about 1 foot apart, with some 16 inches between each lot of double rows. The plants are left very thick, and a small solid root is thus obtained, which finds a ready sale. The crop is stated to amount to 80 tons per acre.

SELECTED CONTENTS OF PERIODICALS.

Transactions of the Surveyors' Institution. XL. III.
The Calculation of Equivalent Manurial Values, *G. Cawkwell Phillips.*

Journal of Economic Biology. 2. III.
Application of Economic Biology to Agriculture, *Walter E. Collinge.*

Bulletin Mensuel de l'Office de Renseignements Agricoles. 16. XI.
Rapport sur les Travaux de la Station de Climatologie Agricole de Juvisy, 1906—Action des Diverses Radiations, *C. Flammarion.*

Fühlings Landwirtschaftliche Zeitung. 56. 22.
Über Düngungsversuche mit Kalkstickstoff, Stickstoffkalk und Kalksalpeter, *Dr. Steglich.*

Mitteilungen der Deutschen Landwirtschafts-Gesellschaft. 22. 46.
Das Korngewicht der Getreidesorten, *Dr. W. Elder.*

Naturwissenschaftliche Zeitschrift für Land und Forstwirtschaft. 5. 12.
Die Waldbewässerung als Massregel der forstlichen Bodenmelioration und Bestandspflege, *C. Seibt*; Die Kultur der Korkeiche in Andalusien, *F. W. Neger*; Experimentell-biologische Studien an Borkenkäsern, *C. Hennings*; Einmalige oder wiederholte Begattung bei Borkenkäsern, insbesondere bei Ips typographus L., *O. Nüsslin.*

Bulletin de l'Agriculture. XXIII. 10.
Expériences culturales concernant la solubilité citrique et la finesse des scories de déphosphoration, *C. Schreiber.*

Annual Report of the New Jersey Agricultural Experiment Station, 1905–6.
Chemical and Bacteriological Factors in the Ammonification of Soil Nitrogen; Plant-food removed by a Peach Tree in Ten Years' Growth; Plant-food used by Asparagus in Eight Years' Growth.

Year Book of the United States Department of Agriculture, 1906.
The Present Status of the Nitrogen Problem, *A. F. Woods*; Introduction of Elementary Agriculture into Schools, *A. C. True*; The use of Soil Surveys, *J. A. Bousteel*; Birds that eat Scale Insects, *W. L. McAtee*: The preparation of Unfermented Apple Juice, *H. C. Gore*; Freight Costs and Market Values, *F. Andrews.*

ADDITIONS TO THE LIBRARY.

[NOTE.—The receipt of *annual* publications of foreign agricultural and other departments, experiment stations and societies is not noted in the monthly list of additions to the Library, but a list of all such publications, which are regularly received, will be given from time to time.]

Australasia—

O'Callaghan, M. A.—Dairying in all its branches (361 pp.), 1906, 7s. 6d. Testing Milk and Cream (84 pp.), 1907, 1s.; *Bradshaw, G.*—Farmers' Fowls (164 pp.), 1907, 1s. 6d. New South Wales Department of Agriculture.

Hall, Robt.—A Key to the Birds of Australia. (124 pp.) London: R. H. Porter.

Hall, Robt.—The Useful Birds of Southern Australia. (30 pp.); Glimpses of Australian Bird Life. (63 pp.) Melbourne: T. C. Lothian. 1907.

France—

Congrès Colonial Français de 1907. (437 pp.) Paris, 1908.

Germany—

Wiesner, J.—Der Lichtgenuss der Pflanzen. (322 pp.) Leipzig, 1907.

Great Britain—

Curtis, C. E.—Practical Forestry. (148 pp.) London: Crosby, Lockwood, 1908. 3s. 6d. net.

Scoble, H. T.—Land Treatment of Sewage. (76 pp.) London: St. Bride's Press. 5s. net.

Waghorn, T.—Traders and Railways (The Traders' Case). (233 pp.) London: Effingham Wilson, 1907.

Motor Union of Great Britain and Ireland.—Report of the Fuels Committee. (80 pp.) London, 1907. 1s.

Board of Education.—Special Reports on Educational Subjects. Vol. 18. The Education and Training of the French Primary School Teacher. [Cd. 3777]. (222 pp.] London: Wyman, 1907. 1s.

Klein, E.—Report of Experiments and Observations on the Vitality of the Bacillus of Typhoid Fever and of Sewage Microbes in Oysters and other Shellfish. (79 pp.)

Irving, W.—Every Man's Book of the Greenhouse. (247 pp.) London: Hodder and Stoughton, 1907.

Sewell, A. J.—The Dog's Medical Dictionary. 2nd edition. (350 pp.) London: Routledge, 1907. 5s.

Webb's Practical Farmers' Account Book.—(160 pp.) London: Jarrold & Sons.

Wilcox, E. V.—Ostertag's Handbook of Meat Inspection. (884 pp.) London: Ballière, Tindall & Cox, 1907. 31s. 6d. net.

Beebe, C. W.—The Bird: Its Form and Function. (496 pp.) London: Archibald Constable, 1907. 14s. net.

Cavers, F.—Plant Biology. (460 pp.) London: W. B. Clive, 1907. 3s. 6d.

Thompson, H.—Elementary Lectures on Veterinary Science. 3rd Edition. (411 pp.) London: Ballière, Tindall & Cox, 1908. 10s. 6d. net.

Clements, F. E.—Plant Physiology and Ecology. (315 pp.) London: Archibald Constable, 1907. 10s. 6d. net.

Douglas, Loudon M.—The Origin and Development of the Meat Trade. (8 pp.) 1907.

India—

Imperial Department oj Agriculture in India.—Bull. 6.—The Ticks Infesting Domesticated Animals in India. (13 pp.) 6d. Botanical Series, Vol. ii., No. 2. The Indian Cottons (23 pp. + xiv plates). Chemical Series, Vol. i., No. 5. Construction of Drain Gauges at Pusa (77 pp. + xx plates).

[Books may be borrowed from the Board's Library on certain conditions, which may be ascertained on application.]

PRICES OF AGRICULTURAL PRODUCE.

AVERAGE PRICES of LIVE STOCK in ENGLAND and SCOTLAND in the Month of December, 1907.

(Compiled from Reports received from the Board's Market Reporters.)

Description.	England. First Quality.	England. Second Quality.	Scotland. First Quality.	Scotland. Second Quality.
FAT STOCK :—	per stone.*	per stone.*	per cwt.†	per cwt.†
Cattle :—	s. d.	s. d.	s. d.	s. d.
Polled Scots	7 9	7 3	38 10	34 10
Herefords	7 8	6 9	—	—
Shorthorns	7 8	7 0	37 5	34 0
Devons	7 11	7 4	—	—
	per lb.* d.	per lb.* d.	per lb.* d.	per lb.* d.
Veal Calves	7¾	7	8½	6½
Sheep :—				
Downs	9	8¼	—	—
Longwools	8½	7½	—	—
Cheviots	9	8½	9	7¾
Blackfaced	8½	7¾	8½	7½
Cross-breds	9	8	9¼	8
	per stone.*	per stone.*	per stone.*	per stone.*
Pigs :—	s. d.	s. d.	s. d.	s. d.
Bacon Pigs	6 5	5 11	6 0	5 5
Porkers	6 11	6 6	6 5	5 9
LEAN STOCK :—	per head.	per head.	per head.	per head.
Milking Cows :—	£ s.	£ s.	£ s.	£ s.
Shorthorns—In Milk	22 2	18 11	22 8	18 7
,, —Calvers	21 12	18 11	19 2	17 3
Other Breeds—In Milk ..	21 11	15 5	19 9	16 3
,, —Calvers ...	15 5	14 0	19 17	16 2
Calves for Rearing	2 2	1 13	2 7	1 9
Store Cattle :—				
Shorthorns—Yearlings ...	9 18	8 9	10 4	8 3
,, —Two-year-olds ...	13 15	12 7	14 8	12 6
,, —Three-year-olds	16 6	14 16	16 0	14 1
Polled Scots—Two-year-olds	—	—	15 4	13 0
Herefords— ,,	14 11	11 19	—	—
Devons— ,,	14 16	12 17	—	—
Store Sheep :—	s. d.	s. d.	s. d.	s. d.
Hoggs, Hoggets, Tegs, and Lambs—				
Downs or Longwools ...	43 8	39 1	—	—
Scotch Cross-breds... ...	—	—	31 4	25 8
Store Pigs :—				
Under 4 months	22 9	16 5	18 4	14 10

* Estimated carcase weight.

† Live weight.

AVERAGE PRICES of DEAD MEAT at certain MARKETS in ENGLAND and SCOTLAND in the Month of December, 1907.

(Compiled from Reports received from the Board's Market Reporters.)

Description.	Quality.	London.	Birmingham.	Manchester.	Liverpool.	Glasgow.	Edinburgh.
		per cwt. s. d.	per cwt. s. d.	per cwt. s. d.	per cwt. s. d.	per cwt. s. d.	per cwt. s. d.
BEEF :—							
English	1st	52 6	49 6	49 6	49 6	57 0*	53 6*
	2nd	49 6	44 6	44 6	45 6	53 0*	47 0*
Cow and Bull ...	1st	35 0	42 6	42 0	40 0	42 0	40 6
	2nd	27 0	38 0	36 0	36 0	37 6	35 0
U.S.A. and Canadian :—							
Port Killed ...	1st	54 0	48 0	47 6	49 6	49 6	—
	2nd	49 0	41 6	42 0	46 0	46 0	46 6
Argentine Frozen—							
Hind Quarters ...	1st	31 6	32 0	30 6	31 0	34 0	33 0
Fore ,, ...	1st	25 6	25 6	25 6	25 6	26 0	27 6
Argentine Chilled—							
Hind Quarters ...	1st	41 6	40 0	41 0	41 0	—	39 6
Fore ,, ...	1st	29 0	28 0	29 0	29 0	—	28 0
American Chilled—							
Hind Quarters ...	1st	55 6	54 0	55 0	53 6	55 6	56 0
Fore ,, ...	1st	36 0	35 6	36 0	35 0	41 6	37 6
VEAL :—							
British	1st	69 0	62 0	73 6	76 0	—	—
	2nd	64 0	50 6	66 0	70 6	—	—
Foreign	1st	72 6	—	—	—	—	64 6
MUTTON :—							
Scotch	1st	71 6	69 0	74 0	72 6	71 0	65 6
	2nd	66 0	51 6	68 0	67 0	55 0	54 0
English	1st	66 0	70 6	69 0	67 0	—	—
	2nd	60 6	54 0	64 0	61 0	—	—
U.S.A. and Canadian—							
Port killed ...	1st	—	69 0	—	—	—	—
Argentine Frozen ...	1st	30 6	30 6	30 6	30 6	30 6	31 0
Australian ,, ...	1st	28 0	29 6	28 0	28 0	30 6	—
New Zealand ,, ...	1st	39 0	37 6	—	—	—	—
LAMB :—							
British	1st	—	—	—	—	—	—
	2nd	—	—	—	—	—	—
New Zealand ...	1st	51 6	53 0	51 6	51 6	51 6	—
Australian	1st	46 6	48 0	43 0	43 0	46 6	—
Argentine	1st	44 6	47 0	—	—	—	—
PORK :—							
British	1st	56 0	62 0	64 0	63 0	55 6	52 0
	2nd	50 0	54 6	59 0	58 6	52 6	42 6
Foreign	1st	54 0	64 6	63 6	63 6	—	—

* Scotch.

AVERAGE PRICES of **British Corn** per Quarter of 8 Imperial Bushels, computed from the Returns received under the Corn Returns Act, 1882, in each Week in 1905, 1906 and 1907.

Weeks ended (*in* 1907).	Wheat.			Barley.			Oats.		
	1905.	1906.	1907.	1905.	1906.	1907.	1905.	1906.	1907.
	s. d.	*s. d.*	*s. d.*	*s. d.*	*s. d.*	*s. d.*	*s. d.*	*s. d.*	*s. d.*
Jan. 5 ...	30 4	28 4	26 0	24 4	24 6	23 11	16 3	18 2	17 3
,, 12 ...	30 4	28 6	26 1	24 6	24 8	24 2	16 3	18 4	17 4
,, 19 ...	30 5	28 5	26 1	25 0	24 11	24 1	16 5	18 4	17 5
,, 26 ...	30 6	28 7	26 2	25 1	25 1	24 5	16 7	18 7	17 5
Feb. 2 ...	30 6	28 10	26 3	25 0	25 1	24 4	16 7	18 10	17 5
,, 9 ...	30 7	28 10	26 6	25 2	25 3	24 5	16 8	18 10	17 7
,, 16 ...	30 5	28 11	26 7	25 2	25 6	24 1	16 9	19 0	17 7
,, 23 ...	30 10	28 10	26 10	25 0	25 4	24 2	16 10	19 0	17 9
Mar. 2 ...	30 8	28 8	26 9	25 2	25 0	24 2	16 10	19 0	17 9
,, 9 ...	30 9	28 5	26 8	25 2	25 1	23 11	16 10	18 8	17 11
,, 16 ...	30 10	28 5	26 10	24 11	24 8	24 2	16 10	18 10	18 0
,, 23 ...	30 9	28 4	26 10	25 2	24 4	24 0	17 0	18 8	18 1
,, 30 ...	30 9	28 3	26 8	25 1	24 5	23 9	16 11	18 11	18 2
Apl. 6 ...	30 9	28 7	26 9	25 6	24 2	24 3	17 0	18 11	18 3
,, 13 ...	30 8	28 11	26 8	24 3	24 4	23 9	17 6	19 4	18 6
,, 20 ...	30 8	29 4	26 8	24 4	24 0	23 3	17 5	19 1	18 7
,, 27 ..	30 9	29 6	26 10	24 4	24 0	23 3	17 9	19 6	18 9
May 4 ...	30 8	29 10	27 0	25 3	23 10	23 6	18 0	19 9	19 3
,, 11 ...	30 8	30 1	27 6	24 10	24 1	24 0	18 3	20 0	19 7
,, 18 ...	30 10	30 3	28 4	24 8	23 10	23 10	18 5	20 1	20 1
,, 25 ...	30 11	30 4	29 7	24 4	24 2	24 3	18 8	20 2	20 5
June 1 ...	31 3	30 4	31 4	23 6	22 10	24 0	19 1	20 5	20 8
,, 8 ...	31 4	30 3	32 0	24 0	23 4	24 7	18 11	19 11	20 7
,, 15 ...	31 7	30 4	31 10	26 0	23 6	24 7	19 1	20 2	20 11
,, 22 ...	31 7	30 5	31 4	23 9	22 10	24 11	18 10	20 2	20 9
,, 29 ...	31 8	30 3	31 2	23 2	24 3	24 6	19 7	20 1	20 8
July 6 ...	32 1	30 2	31 3	22 11	23 0	24 8	19 6	20 2	20 11
,, 13 ...	32 3	30 5	32 0	23 10	23 8	24 10	19 7	20 4	20 11
,, 20 ...	32 2	30 3	32 6	23 7	23 2	24 6	18 11	20 5	21 1
,, 27 ...	32 3	30 5	32 11	23 11	22 4	27 3	19 3	20 2	20 8
Aug. 3 ...	31 11	30 9	33 2	22 0	22 1	26 4	18 4	19 3	21 2
,, 10 ...	30 5	30 5	33 5	22 5	23 0	26 6	16 11	17 11	21 3
,, 17 ...	28 5	29 0	33 6	23 4	24 2	25 9	16 4	17 0	20 4
,, 24 ...	27 1	27 9	33 7	23 6	25 0	25 0	15 9	16 10	19 8
,, 31 ...	26 11	26 9	33 10	23 5	24 3	24 6	15 9	16 6	18 11
Sept. 7 ...	27 1	26 4	31 11	23 4	24 9	24 2	15 11	16 3	17 7
,, 14 ...	26 11	25 11	31 4	23 7	24 3	24 4	16 0	16 1	17 6
,, 21 ...	26 8	25 9	31 5	23 10	24 3	25 0	15 11	16 0	17 6
,, 28 ...	26 9	25 9	31 8	24 3	24 8	25 3	16 1	16 2	17 8
Oct. 5 ...	26 9	26 1	32 6	24 9	25 0	25 5	16 3	16 3	17 9
,, 12 ...	26 11	26 3	33 3	24 10	25 3	25 9	16 6	16 7	17 11
,, 19 ...	27 1	26 6	34 4	25 0	24 10	26 3	16 7	16 8	18 0
,, 26 ...	27 4	26 7	35 9	24 11	24 10	27 2	16 8	16 10	18 7
Nov. 2 ...	27 10	26 7	36 3	24 9	24 8	27 7	17 1	16 11	18 10
,, 9 ...	28 3	26 6	35 10	24 10	24 8	27 8	17 4	17 1	18 10
,, 16 ...	28 7	26 4	35 1	24 6	24 4	27 8	17 8	17 2	18 8
,, 23 ...	28 5	26 3	34 7	24 6	24 1	27 5	17 9	17 3	18 9
,, 30 ...	28 8	26 1	34 7	24 6	24 1	27 5	17 11	17 2	18 7
Dec. 7 ...	28 6	26 1	34 7	24 7	24 1	27 1	17 11	17 4	18 6
,, 14 ...	28 5	26 1	34 8	24 5	23 11	27 0	17 11	17 3	18 5
,, 21 ...	28 4	26 3	34 9	24 6	24 3	27 1	17 11	17 3	18 3
,, 28 ...	28 3	26 0	34 6	24 7	24 1	26 10	18 1	17 3	18 0

NOTE.—Returns of purchases by weight or weighed measure are converted to Imperial Bushels at the following rates: Wheat, 60 lbs.; Barley, 50 lbs.; Oats, 39 lbs. per Imperial Bushel.

CORN PRICES:—ANNUAL AVERAGES.

AVERAGE PRICES of **British Corn** per Quarter of 8 Imperial Bushels, computed from the Weekly Averages of Corn Returns from the Returning Markets, together with the QUANTITIES returned as sold at such Markets during each of the Years 1901 to 1907.

Years.	Prices.			Quantities.		
	Wheat.	Barley.	Oats.	Wheat.	Barley.	Oats.
	s. d.	s. d.	s. d.	Quarters.	Quarters.	Quarters.
1901	26 9	25 2	18 5	2,605,550	3,369,629	714,215
1902	28 1	25 8	20 2	2,247,937	2,783,424	831,285
1903	26 9	22 8	17 2	2,296,723	2,875,749	1,049,995
1904	28 4	22 4	16 4	2,138,142	3,437,176	1,316,516
1905	29 8	24 4	17 4	2,467,551	3,265,613	1,073,611
1906	28 3	24 2	18 4	2,684,101	3,210,995	1,011,931
1907	30 7	25 1	18 10	2,722,847	3,317,521	1,374,260

AVERAGE VALUE per IMPERIAL QUARTER OF WHEAT IMPORTED into the UNITED KINGDOM from the undermentioned Foreign Countries and British Possessions in the years 1905, 1906, and 1907.

Countries from which Exported.	Average Value per Imperial Quarter.		
	1905.	1906.	1907.
	s. d.	s. d.	s. d.
Argentine Republic...	30 7	29 10	31 6
Chile	30 4	—	36 8
Germany	31 11	27 7	—
Bulgaria	29 4	27 5	—
Roumania	31 0	28 11	30 2
Russia	31 9	29 10	32 8
Turkey	28 1	28 11	31 3
U.S. of America { Atlantic ...	31 9	30 7	33 9
U.S. of America { Pacific	31 7	30 11	31 5
India, British	29 8	29 4	33 9
North America, British	31 8	30 8	34 1
Australia	32 4	31 2	33 8
New Zealand	30 1	32 2	—

AVERAGE PRICES of **Wheat, Barley**, and **Oats** per Imperial Quarter in FRANCE, BELGIUM, and GERMANY, and at PARIS, BERLIN, and BRESLAU.

—		Wheat. 1906.	Wheat. 1907.	Barley. 1906.	Barley. 1907.	Oats. 1906.	Oats. 1907.
		s. d.	*s. d.*	*s. d.*	*s. d.*	*s. d.*	*s. d.*
France:	November	39 6	40 2	26 1	25 11	22 11	20 1
	December	39 7	39 6	26 4	25 11	23 0	20 1
Paris:	November	40 4	38 5	26 7	26 2	23 5	19 0
	December	40 2	38 5	26 7	26 2	23 3	18 11
Belgium:	September	28 3	34 7	23 2	25 11	17 11	20 9
	October ...	28 7	36 7	24 3	27 4	18 6	21 3
	November	28 4	35 2	24 9	27 0	18 9	21 6
Germany:	November	37 8	48 4	30 1	32 2	22 6	24 4
	December	37 11	46 2	29 0	30 10	22 6	23 4
Berlin:	October ...	—	48 11	—	—	—	24 2
	November	—	48 5	—	—	—	24 7
Breslau:	October ...	—	47 7	—	31 6 (brewing) 26 7 (other)	—	22 2
	November	—	47 4	—	32 6 (brewing) 27 5 (other)	—	22 2

NOTE.—The prices of grain in France have been compiled from the official weekly averages published in the *Journal d'Agriculture Pratique*; the Belgian quotations are the official monthly averages published in the *Moniteur Belge*; the German quotations are taken from the *Deutscher Reichsanzeiger*, the prices for the German Empire representing the average of the prices at a number of markets. The mark is now taken as equal to 11·8*d*.

AVERAGE PRICES of **British Wheat, Barley,** and **Oats** at certain Markets during the Month of December, 1906 and 1907.

—	Wheat. 1906.	Wheat. 1907.	Barley. 1906.	Barley. 1907.	Oats. 1906.	Oats. 1907.
	s. d.	*s. d.*	*s. d.*	*s. d.*	*s. d.*	*s. d.*
London...	27 1	35 6	24 3	26 8	17 10	19 4
Norwich	25 11	34 10	24 3	27 3	16 10	18 3
Peterborough	25 1	34 3	22 10	26 3	16 6	17 10
Lincoln...	25 5	34 1	23 5	26 9	16 7	17 7
Doncaster	25 7	33 11	23 7	26 11	17 0	17 11
Salisbury	26 0	34 5	24 2	26 5	17 8	18 1

AVERAGE PRICES of PROVISIONS, POTATOES, and HAY at certain MARKETS in ENGLAND and SCOTLAND in the Month of December, 1907.

(*Compiled from Reports received from the Board's Market Reporters.*)

Description.	London.		Bristol.		Liverpool.		Glasgow.	
	First Quality.	Second Quality.	First Quality.	Second Quality.	First Quality.	Second Quality.	First Quality.	Second Quality.
	s. *d.*	*s.* *d.*	*s.* *d.*	*s.* *d.*	*s.* *d.*	*s.* *d.*	*s.* *d.*	*s.* *d.*
BUTTER :—	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.
British ...	16 9	14 9	15 0	14 0	—	—	15 0	—
	per cwt.	per cwt.	per cwt.	per cwt.	per cwt.	per cwt.	per cwt.	per cwt.
Irish Creamery	120 0	118 0	120 0	117 0	122 0	120 0	120 0	—
,, Factory	104 0	97 0	101 0	98 6	104 0	95 0	—	—
Danish ...	123 6	121 6	—	—	126 6	124 6	124 0	—
Russian ...	110 6	106 6	110 0	100 0	107 0	97 6	110 0	100 6
Australian ...	117 6	115 0	118 0	112 6	118 6	116 0	120 0	114 0
New Zealand	120 0	117 0	122 6	119 6	121 6	119 6	121 6	—
CHEESE :—								
British—								
Cheddar ...	75 0	69 6	72 0	60 0	74 0	70 0	67 0	63 6
					120 lb.	120 lb.		
Cheshire ...	—	—	—	—	75 0	70 0	—	—
					per cwt.	per cwt.		
Canadian ...	63 6	62 0	63 6	60 6	63 0	60 6	63 6	60 0
BACON :—								
Irish	58 6	57 0	—	—	58 6	56 0	59 0	57 0
Canadian ...	54 6	52 6	54 0	50 6	52 6	51 0	54 0	52 0
HAMS :—								
Cumberland ...	111 6	103 6	—	—	—	—	—	—
Irish	103 6	97 6	—	—	—	—	82 0	74 0
American (long cut) ...	59 0	57 6	54 6	48 0	54 0	47 0	53 0	49 6
EGGS :—	per 120.	per 120.	per 120.	per 120.	per 120.	per 120.	per 120.	per 120.
British ...	19 7	17 11	19 2	—	—	—	—	—
Irish	17 1	15 0	15 1	13 0	15 4	13 6	16 0	12 8
Danish ...	16 4	14 7	16 0	14 0	15 6	13 10	15 1	13 0
POTATOES :—	per ton.	per ton.	per ton.	per ton.	per ton.	per ton.	per ton.	per ton.
Langworthy ...	110 0	100 0	105 0	90 0	105 0	100 0	86 0	81 0
Main Crop ...	107 6	98 6	102 6	90 0	105 0	100 0	—	—
Up-to-Date ...	96 0	86 0	91 0	85 0	80 0	75 0	82 6	76 0
HAY :—								
Clover ...	100 0	89 0	75 0	—	98 0	69 6	85 0	80 0
Meadow ...	89 6	78 6	67 6	—	—	—	65 0	60 0

DISEASES OF ANIMALS ACTS, 1894 to 1903.

NUMBER of OUTBREAKS, and of ANIMALS Attacked or Slaughtered.

GREAT BRITAIN.

(From the Returns of the Board of Agriculture and Fisheries.)

DISEASE.	DECEMBER.		12 MONTHS ENDED DECEMBER.	
	1907.	1906.	1907.	1906.
Swine-Fever :—				
Outbreaks	107	152	2,336	1,280
Swine Slaughtered as diseased or exposed to infection ...	591	842	11,275	7,359
Anthrax :—				
Outbreaks	94	78	1,089	939
Animals attacked	126	116	1,466	1,330
Glanders (including Farcy) :—				
Outbreaks	63	54	850	1,066
Animals attacked	143	97	1,934	2,012
Sheep-Scab :—				
Outbreaks	210	109	751	534

IRELAND.

(From the Returns of the Department of Agriculture and Technical Instruction for Ireland.)

DISEASE.	DECEMBER.		12 MONTHS ENDED DECEMBER.	
	1907.	1906.	1907.	1906.
Swine-Fever :—				
Outbreaks	17	4	161	95
Swine Slaughtered as diseased or exposed to infection ...	157	120	2,789	1,103
Anthrax :—				
Outbreaks	—	—	3	4
Animals attacked	—	—	5	8
Glanders (including Farcy) :—				
Outbreaks	1	—	6	8
Animals attacked	1	—	11	16
Sheep-Scab :—				
Outbreaks	85	33	326	254

(5,000 1 | 08—H & S 2783)

THE JOURNAL

OF THE

BOARD OF AGRICULTURE.

Vol. XIV. No. 11.

FEBRUARY, 1908.

THE MARKETING OF POULTRY.

The demand for high-class poultry in Great Britain has increased very greatly within recent years, and, even apart from the growth of the population, there appears to be ample room for extension in the home supply. Even in those markets where the chief business is in unfatted specimens, a steady increase in the sale of finer quality fowls is evident. As their greater value is appreciated by consumers, it may be anticipated that the demand for these will grow. The object of most producers should be to provide for this better class trade. American, Russian and other Continental supplies are frozen, and do not enter into very serious competition with freshly-killed British poultry if of suitable breeds and well finished, although the American have been fatted.

MARKETS.—*London.*—The best markets are those of Leadenhall and Smithfield, in London, but to obtain good prices the birds sent up must be very carefully fed and well finished. Overstocking of these markets with the very best quality of fattened birds is hardly likely to occur, and for birds of 4 to 5 lb. and over, according to the season of the year, there is a ready sale. Where disparities in prices in the same consignment occur it will frequently be found to be due to variation in size and quality. During the spring there is a good demand for young chickens, weighing 2½ to 3 lb., unfatted but well fed, and a more limited sale of milk chickens, weighing about 12 ozs.

In the London markets the best season for large well-fattened fowls is from November to February, and from March to July for moderate sized birds. Ducklings sell fairly well all the year

round, but best from February to June; there is a fairly good demand for fat ducks in the autumn and winter; goslings in May and June and at Michaelmas; fat geese at Christmas and for a short time afterwards, but their season is limited; turkeys fetch high prices according to size, appearance and straightness of breast bone, at and for a very short time after Christmas. As to days of the weeks at Smithfield (Central Market), Tuesdays, Thursdays and Fridays are best; at Leadenhall, Mondays, Wednesdays, Thursdays and Saturdays.

Provincial Markets.—Information as to demand, prices, &c., in some of the best markets outside London is given in the tables appended, which have been compiled from particulars obtained through the Board's market reporters.

KILLING.*—All birds should be starved for twenty-four hours before killing in order that the crop and intestines may be emptied of food. A great amount of loss arises from neglect of this precaution. They should be killed by dislocating the neck just where it joins the head, unless the purchaser wishes them to be killed in a special way. Some salesmen like them to be bled by a knife passed through the slit in the roof of the mouth, but this is required in only a few cases. Bleeding is apt to spoil the feathers and soil the packing, and this will reduce the price of the whole consignment. Dislocation of the neck properly performed results in the breaking of the jugular vein, and the blood drains completely from the body veins into the neck.

PLUCKING.—Birds should always be plucked while the body is still warm, as the feathers then come out more easily and there is less danger of tearing the skin, for except among the poorer class of buyers a badly plucked bird is of but little value. Unless this is done when warm, the bird must not be plucked until quite cold, that is, at least twenty-four hours after killing.

In plucking, the operator should hold the bird by the legs, with the head hanging downwards, or, in the case of turkeys and geese, suspend it by the legs to a cord hung from the roof. Feathers are drawn by a firm yet gentle pull towards the head,

* Some of the suggestions in this article as to killing, plucking, &c., have already appeared in the *Journal* (October, 1906), but it is thought it may be useful to reproduce them here in a revised form, with the additional particulars as to provincial markets now available.

which action loosens them from the skin. The plucking should begin at the tail and be continued in the following order: back, neck, wings, sides, legs and breast. It is unwise to start with the breast as the surface veins in that part of the body are the last to drain dry, and the carcase will be discoloured if any of these veins are broken. The breast bone should not be broken.

Fowls must be plucked clean except on the head and half the neck; turkeys must also be plucked clean, but leaving the feathers on the outer ends of the wings and the tail; in ducks and geese, the wings and half the necks must be left unplucked.

The legs and feet of all birds should be very clean.

SHAPING.—When quite clean, chickens should be singed and packed tightly breast downwards in a shaping trough, with the heads hanging over the front board, and left in this position for the flesh to set and to cool. Shaping boards are usually made to hold eight to twelve birds.

A long narrow board should then be placed along their backs and the board weighted, a common method being to use one 9-lb. brick to every two birds. In placing the birds in the trough the stern is pushed hard up against the back board, thus giving the birds a shortened appearance.

For some markets the birds are required to be tied down in Devonshire fashion. This is done as follows: Immediately after plucking the back, the claws are removed and a gash is made on each side of the middle toe. A short string is then tied to each of these toes, the legs are drawn forward and inwards, and the two strings are tied together behind the neck, and pulled tight. A second and rather longer string is now tied round the hocks, crossed on the vent, and fastened at the back of the tail, again pulling tight. Finally, the wings are tucked in, and the bird will be ready for packing directly it is quite cold.

Ducks and geese have the wings turned, and are usually weighted, thus compressing them into a good shape. This must be done when they are warm, otherwise they do not set properly.

Turkeys are tied down in the way described as the Devonshire fashion for chickens or in the Norfolk fashion.

GRADING AND PACKING.—A most essential point is that all poultry should be quite cold before they are dispatched. On large plants a chilling chamber is found most useful, but in the

absence of this they should be allowed to remain for some hours in a cool room, until the body heat has entirely gone.

The question of the grading of poultry is also of great importance. It is very desirable that only birds of about the same size should be packed together, but if those of different sizes must be placed in the same package they should be arranged in layers, and the fact that they are so packed should be stated when advising buyer of dispatch. The sizes may be, for fowls, 3 to $3\frac{1}{2}$ lb., $3\frac{1}{2}$ to 4 lb., 4 to $4\frac{1}{2}$ lb., and $4\frac{1}{2}$ to 5 lb. It is advisable that separate pads, baskets or boxes should be used for different sizes, each box being marked with a distinctive brand and clearly showing the number and size of the birds. In Surrey it is the practice after the chickens have been shaped for them to be floured and packed in specially made crates called "pads," which are of different sizes and hold respectively 12, 16, 20 and 24 birds.

Ducks, geese and turkeys should be sent in baskets or strong crates, with the number and actual weight of the contents marked on one end outside.

In packing poultry the birds are laid breast downwards on clean straw, and packed as tightly as possible to prevent their shifting while on rail. Clean butter paper is, by the best packers, placed between each layer of birds to prevent the straw marking the backs and rubbing off the skin. Though this means a few more minutes per package, it brings a more ready sale and is an excellent practice.

FORWARDING.—A postcard should be sent to the buyer or salesman telling him by what route and train the crate will travel, and mentioning by what mark he will be able to identify the crate.

The crate should travel by an evening train in order to reach the market in the very early morning, and it should be consigned at dealers' rates. In warm weather the birds are less likely to be heated if they travel by night.

GENERAL.—There is a growing demand for goslings weighing from 6 to 8 lb. during the London season—from the middle of May to the end of June. Goslings sold then are off the ground before keep becomes valuable for other farm stock.

Fowls must not be drawn when sent to the markets, but some buyers prefer them to be "roped," that is, to have the intestine

drawn out at the vent, leaving the rest of the inside intact, during the hot months. This is frequently done in the Midlands and in Ireland. Unless the distance from the market is considerable the birds are unpacked and sold within a few hours of dispatch, so that this practice is not generally necessary except in hot weather.

It is the custom on farms to keep old hens long after they are really profitable from a breeding or laying point of view. A hen is rarely worth her keep after the conclusion of her second year. But these are in demand at Easter, in June and early July, when good prices are paid by Jewish dealers. They must be in good condition and sent alive.

Manchester Market.—The following note with regard to the Manchester Poultry trade will be of interest:—

The supplies of chickens are for the greater part of the year almost entirely Irish, and except for the months of December to April, it is estimated that Ireland supplies nine-tenths of the chickens sold. A few extra good quality chickens are sent from Anglesey, and also a few from the district round Oswestry; these are for the better class trade, and do not affect the trade generally. During the autumn a few chickens are sent alive from the district round Carlisle. The reasons for the popularity of the Irish chickens are the uniformity of quality, and the certainty of supply, as well as the short time in which orders can be filled. It is stated that within twelve hours an order can be sent for any number up to twelve dozen, and the birds received, viâ Holyhead, ready plucked.

During the early months of the year Russian fowls landed at Hull, and American and Canadian landed at Liverpool, form the chief bulk of the supplies. At Christmas, French, Italian, and Servian are sent in fairly large quantities.

There is not a very great demand for ducks, and although Ireland supplies the majority, a considerable number of the best ducks come from Aylesbury; there is also a considerable trade in live ducks from Forfarshire and Aberdeenshire; Russian ducks are used to a large extent at Christmas and into January, but from then till the duckling trade commences there is practically no demand.

Question.	Brighton.	Chichester.
CHICKENS :—		
1. Weights in most demand ...	$3\frac{1}{2}$–4 lb.	$3\frac{1}{2}$–4 lb.
2. If fatted	Yes.	No.
3. Colour of flesh preferred ...	White.	White.
4. Season when prices highest ...	March to June.	March and April.
5. Average prices	3/- to 3/6.	5/- to 6/-
6. If to be shaped, and how ...	Pressed.	Tied for show.
DUCKS :—		
7. Weights in most demand ...	$3\frac{1}{2}$–5 lb.	5–6 lb.
8. Season of demand	Spring and early summer.	June, July, Christmas.
9. Average prices	3/- to 3/6.	2/9 to 3/6.
GEESE :—		
10. Weights in most demand ...	10–12 lb.	12–14 lb.
11. Season of demand	Sept. to Christmas.	Michaelmas and Christmas.
12. Average prices	8*d.* to 10*d.* per lb.	8*d.* to 10*d.* per lb.
TURKEYS :—		
13. Weights in most demand ...	10–16 lb.	Cocks 16–18 lb., hens 10–12 lb.
14. Season	Oct. to Feb.	Christmas to Easter.
15. If fatted	Yes.	Well fatted but not crammed.
16. Average prices	9*d.* to 1/- per lb.	Cocks 1/- per lb., hens 10*d.* per lb.

Question.	Bristol.	Newport, Mon.
CHICKENS :—		
1. Weights in most demand ...	3–4 lb.	3–$3\frac{1}{2}$ lb.
2. If fatted	Well fed, not crammed.	No.
3. Colour of flesh preferred ...	White.	White.
4. Season when prices highest ...	March to June.	April to May, not much variation.
5. Average prices	2/- to 2/6.	3/- to 3/6.
6. If to be shaped, and how ...	Tied at knuckles and from toes to back. Others simply plucked.	Trussed ready for cooking, but breast unbroken and not flattened.
DUCKS :—		
7. Weights in most demand ...	3–5 lb.	3–$3\frac{1}{2}$ lb.
8. Season of demand	March, May, Christmas.	June to Oct.
9. Average prices	7*d.* per lb.	3/- to 3/6 each.
GEESE :—		
10. Weights in most demand ...	10–14 lb.	6–9 lb.
11. Season of demand	Michaelmas to end Jan.	Michaelmas to Christmas.
12. Average prices	8*d.* lb. (retail), $5\frac{1}{2}d.$ to $6\frac{1}{2}d.$ lb. Irish, 6*d.* to 7*d.* lb. English (wholesale).	11*d.* to 1/-.
TURKEYS :—		
13. Weights in most demand ...	Cocks 14–20 lb., hens 8–12 lb.	12–13 lb.
14. Season...	Nov. to Feb.	Oct. to March.
15. If fatted	Cannot be too well fatted.	Unfatted generally.
16. Average prices	Wholesale dealers' prices: —Cocks $9\frac{1}{2}d.$ to 10*d.* lb., hens 8*d.* to 9*d.* lb.	1/- to 1/2 per lb.

Portsmouth.	Dorchester.	Plymouth.
3–4½ lb.	—	4–5 lb.
Yes.	Yes.	Naturally fed.
Yellow and white.	White.	Yellow.
Jan. to July.	Spring.	Nov. to Jan.
2/9 to 3/9.	2/- to 3/-.	5/- to 5/6 couple.
—	(Sold alive.)	Shaped, tied up, feathers left on wings.
3–5 lb.	—	5 lb.
June to Sept.	Christmas and spring.	Dec. to end of Jan.
2/6 to 4/-	2/6 tc 3/3.	6/- couple, down to 5/- in spring.
8–14 lb.	—	8 lb.
Sept. to March.	Michaelmas and Christmas.	Christmas to end of Jan.
7*d.* to 9*d.* per lb.	5/- to 8/-.	10*d.* lb. drawn, 7*d.* lb. round.
7–18 lb.	18–22 lb.	16–20 lb.
Oct. to March.	Christmas.	Christmas.
Yes.	Yes.	Well fed but not crammed.
8*d.* to 1/3 per lb.	6/- to 18/-.	to 10*d.* per lb.

Hereford.	Birmingham.	Wolverhampton.
3½–5 lb.	3–5 lb., lower for hotels.	3½–4 lb., capons 4–5 lb.
Vary.	Ordinarily fed.	No.
White.	White, but not so essential as at some places.	White.
Spring.	Very scarce and dear April to June, chiefly Americans.	March and April.
8*d.* to 1/6 per lb.	6*d.* to 8*d.* per lb. and 1/- per lb. in early summer.	5/6 to 7/- couple.
Trussed.	No particular necessity.	No, but many smash breastbone.
4–5 lb.	3–4 lb.	8–10 lb. dressed in first feathers.
Autumn.	April to end of June.	May and June.
9*d.* to 9½*d.* per lb.	6/- to 7/6 per couple April and May, 4/- in late autumn.	6/- to 7/6 couple.
9–13 lb.	8–10 lb.	9–14 lb. (dressed).
Winter.	Sept. and Oct.	Sept. 9 lb. and Dec. 14 lb.
8*d.* to 8½*d.* per lb.	6*d.* to 7*d.* per lb.	7/- to 9/- each.
12–14 lb.	12–15 lb. at Christmas, lighter other times.	12–14 lb. (dressed).
Christmas.	Christmas for English, Oct. to Feb. for foreign.	Dec.
Yes.	Ordinarily fed.	No.
11*a.* to 1/2 per lb.	8*d.* to 10*d.*, and rather more at Christmas.	12/- to 14/- each (dressed).

Questions.	Shrewsbury.	Chester.
CHICKENS :—		
1. Weights in most demand ...	4–5 lb.	3–3½ lb. rough, 2½ lb. dressed.
2. If fatted	Fed ordinarily.	Not crammed.
3. Colour of flesh preferred ...	White.	White, but quality is more considered.
4. Season when prices highest ...	March and April.	Feb. to Sept.
5. Average prices	3/6 to 5/6 couple.	5/- to 6/- couple.
6. If to be shaped, and how ...	Trussed ready for oven.	No.
DUCKS :—		
7. Weights in most demand ...	Never weighed.	3 lb. (dead).
8. Season of demand	June to Aug. ; Dec.	May to Aug.
9. Average prices	5/- to 6/- couple.	6/- to 7/- couple for the best.
GEESE :—		
10. Weights in most demand ...	10–12 lb.	8–10 lb. Not much demand.
11. Season of demand	Michaelmas and Christmas.	Christmas.
12. Average prices	8*d.* to 9*d.* per lb.	9*d.* to 10*d.* per lb.
TURKEYS :—		
13. Weights in most demand ...	12–15 lb.	10–14 lb.
14. Season	Nov. to March.	Dec. to end Feb.
15. If fatted	Yes.	Natural feeding.
16. Average prices	Hens 8*d.* per lb., cocks 9*d.* to 10*d.* per lb.	1/- per lb.

Question.	Glasgow.	Aberdeen.
CHICKENS :—		
1. Weights in most demand ...	2½–3 lb.	3½–4½ lb.
2. If fatted	No.	Yes.
3. Colour of flesh preferred ...	White.	White.
4. Season when prices highest ...	April to June.	End of Feb. to end of April.
5. Average prices	1/6 to 2/6.	6*d.* to 9*d.*
6. If to be shaped, and how ...	Breast broken, wings under back, legs bent under wings.	Not shaped by wholesale people, but retailers shape to customers' tastes.
DUCKS :—		
7. Weights in most demand ...	3–5 lb.	4–8 lb.
8. Season of demand	June to Aug.	Dec. to middle of Jan., ducklings May to Aug.
9. Average prices	2/- to 2/9.	4*d.* to 5*d.* per lb.
GEESE :—		
10. Weights in most demand ...	8–15 lb.	12–13 lb.
11. Season of demand	Michaelmas and Christmas.	16 Dec. to 1 Jan.
12. Average prices	8*d.* to 10*d.* per lb.	4*d.* to 5*d.* per lb.
TURKEYS :—		
13. Weights in most demand ...	12–15 lb.	10–16 lb.
14. Season	Oct. to May.	Dec. and Jan.
15. If fatted	No.	Yes.
16. Average prices	1/- to 1/2 per lb.	8*d.* to 1/- per lb.

Liverpool.	Manchester.	Carlisle.
2½–4 lb.	3–4 lb.	4½ lb.
Ordinarily fed. White.	No. White.	No. White.
May to July. 8*d.* per lb. wholesale, 10*d.* per lb. retail. No.	Feb. to April. 18/- to 20/- per doz. wholesale, 2/- to 2/6 each retail. No.	Feb. to April. 2/9 to 3/3. Yes.
3½–5 lb. Aug. to Oct. 8*d.* per lb. wholesale, 10*d.* per lb. retail.	4–8 lb. June to Oct. 8*d.* per lb. wholesale, 10*d* per lb. retail.	6 lb. July to Dec. 3/6 to 4/-.
12–14 lb. Christmas. 6½*d.* to 7½*d.* per lb. wholesale, 8½*d.* to 9½*d.* per lb. retail.	9–10 lb. Michaelmas to Jan. 6*d.* to 7*d.* per lb. wholesale, 8*d.* to 9*d.* per lb. retail.	12 lb. Dec. 9*d.* per lb.
12–16 lb. Christmas. Ordinarily fed. 9*d.* to 10*d.* per lb. wholesale, 11*d.* to 1/- per lb. retail.	Hens 6–8 lb., cocks 10–16 lb. Christmas. No. 7*d.* to 10*d.* per lb. wholesale, 9*d.* to 1/- per lb. retail.	16 lb. Christmas. Not artificially. 1/- per lb.

Dundee.	Edinburgh.	Newcastle.
3 lb. chickens, 4–4½ lb. older birds. Yes. White. Jan. to March.	2–3 lb. No. White. May and June.	3–4 lb. Yes. White. April to June.
1/10 to 2/3 wholesale. Trussed.	1/3 to 1/9. Breast bone broken, wings under back, legs under wings, head and neck left on.	2/- to 3/-. Dealers shape them.
4–5 lb. Aug., Christmas, Jan.	3–5 lb. June to Aug.	4–5 lb. Summer months.
1/10 to 3/- wholesale.	2/- to 2/9.	2/- to 3/-.
10 lb. Christmas only.	8–15 lb. Michaelmas.	10–12 lb. Oct. to Jan., especially Christmas.
6*d.* wholesale, 10*d.* retail.	8*d.* to 10*d.* per lb.	5/- to 10/-.
14 lb. Christmas.	12–15 lb. Oct. to May.	12–15 lb. Nov. to Feb., especially Christmas.
Yes. 8*d.* to 10*d.* at Christmas, 1/- (wholesale) at other times.	No. 1/- to 1/2 per lb.	Yes. 10*d.* to 1/- per lb.

Question.	Darlington.	York.
CHICKENS :—		
1. Weights in most demand ...	3½–4 lb.	3½ lb.
2. If fatted	No.	Not artificially.
3. Colour of flesh preferred ...	White.	White.
4. Season when prices highest ...	April.	March to May.
5. Average prices ...	2/6 to 2/9.	2/6 to 3/-.
6. If to be shaped, and how ...	No.	Dealers shape them.
DUCKS :—		
7. Weights in most demand ...	5–6 lb.	4 lb.
8. Season of demand	July and Christmas.	July to Aug.
9. Average prices	4/- to 4/6.	3/- to 3/6.
GEESE :—		
10. Weights in most demand ...	10–12 lb.	10 lb.
11. Season of demand	Michaelmas and Christmas.	Michaelmas and Christmas.
12. Average prices	8/- to 10/-, or 9*d.* to 10*d.* lb.	8*d.* to 10*d.* per lb.
TURKEYS :—		
13. Weights in most demand ...	12–16 lb.	15–20 lb.
14. Season	Christmas to end of Jan.	Christmas.
15. If fatted	Ordinarily fatted.	Not artificially.
16. Average prices	10*d.* to 1/- per lb.	1/- to 1/3.

Question.	Lincoln.	Derby.
CHICKENS :—		
1. Weights in most demand ...	4–4½ lb.	4 lb.
2. If fatted	Yes.	No.
3. Colour of flesh preferred ...	White.	White.
4. Season when prices highest ...	Feb. to May.	Feb. to May.
5. Average prices	9*d.* to 10*d.* per lb.	2/- to 3/-.
6. If to be shaped, and how ...	Yes.	No.
DUCKS :—		
7. Weights in most demand ...	4½–5½ lb.	4 lb.
8. Season of demand	April to June.	June to Aug.
9. Average prices	5/6 to 7/-, couple.	5/- to 7/-, couple.
GEESE :—		
10. Weights in most demand ...	10–14 lb.	10–16 lb.
11. Season of demand	Aug. to Jan.	Michaelmas and Christmas.
12. Average prices	10*d.* to 1/- per lb.	6*d.* to 8*d.* per lb.
TURKEYS :—		
13. Weights in most demand ..	9–20 lb.	16–20 lb.
14. Season	Sept. to Jan.	Christmas.
15. If fatted	Yes.	No.
16. Average prices	1/- to 1/2 per lb.	9*d.* to 1/- per lb.

Leeds.	Bradford.	Wakefield.	Hull.
4–5 lb. Yes. White. Christmas to 12 Aug. 2/6 to 3/-. Salesmen prefer to shape them.	4–5 lb. Yes. White. Christmas to 12 Aug. 2/6 to 3/-. Shaped by salesmen.	$2\frac{1}{2}$–$3\frac{1}{2}$ lb. Ordinarily. White. Early summer. 2/6 to 3/- each. No.	4 lb. No. White. April. 2/3 to 3/-. No.
5–6 lb. July to Christmas. 3/- to 3/6.	5–6 lb. July to Christmas. 3/- to 3/6.	$3\frac{1}{2}$–4 lb. July. 5/6 to 7/6 couple.	4 lb. July to Christmas. 3/- to 3/6.
10–12 lb. Oct. to Christmas. *8d.* to *10d.* per lb.	10–12 lb. Oct. to Christmas. *8d.* to *10d.* per lb.	9–12 lb. Christmas. *9d.* to *10d.* per lb.	9 lb. Dec. *10d.* to 1/- per lb.
15–20 lb. Christmas and winter months. Yes. *10d.* to 1/- per lb.	15–20 lb. Christmas and winter months. Yes. *10d.* to 1/- per lb.	14–20 lb. Christmas. Ordinarily. 1/- to 1/2 per lb.	Hens 10 lb., cocks 20 lb. Christmas. No. *10d.* to 1/- per lb.

Leicester.	Peterborough.	Norwich.	Ipswich.
3 lb. Not artificially. White. Early spring. 2/6 to 2/9 each. Breast broken, head off, wings off from pinion joints, legs from 3rd joint.	4–5 lb. Ordinary fatted. White. Early spring. 2/6 to 3/- each. Trussed, breast not broken.	$3\frac{1}{2}$ lb. Ordinary methods. White. Mar. to May. *8d.* to *10d.* per lb. By dealers.	$3\frac{1}{2}$ lb. Not artificially. White. Early spring. 2/6 to 2/9, Rough plucked.
$3\frac{1}{2}$ lb. June to Aug. 2/6 to 2/9.	6 lb. June to Aug. 3/-.	$3\frac{1}{2}$–$4\frac{1}{2}$ lb. June to Aug. 1/- to 1/2 per lb.	$4\frac{1}{2}$ lb. July and Aug. 3/- to 3/6.
10–15 lb. Michaelmas. *9d.* to *10d.* per lb.	8–10 lb. M'ch'lmas and Xmas. 1/-.	8–14 lb. M'ch'lmas and Xmas. 1/- to 1/2 per lb.	10–14 lb. Christmas. *9d.* to *10d.* per lb.
12–14 lb. Christmas. Yes. 1/- to 1/2 per lb.	12–14 lb. Christmas. Ordinarily fatted. 1/-.	20–25 lb. Christmas. By ordinary methods. 1/- to 1/4 per lb.	10–12 lb. Christmas. Yes. 1/- to 1/2 per lb.

EXPERIMENTS WITH CALCIUM CYANAMIDE.

A. D. HALL, M.A.

The nature of calcium cyanamide, the new nitrogenous fertiliser manufactured by combining the free nitrogen of the atmosphere with calcium carbide, is now well known (see *Journal*, 1906, Vol. 13, pp. 38, 216, 410); and numerous field experiments, both in this country and abroad, have established the fact that as a manure it is practically as effective, nitrogen for nitrogen, as sulphate of ammonia. Certain practical difficulties in its use have, however, been pointed out; it is sold in so fine a powder that it is difficult to handle and disagreeable to sow. It was regarded as so liable to change in a damp atmosphere as to be dangerous to store, and when first introduced it was recommended that it should never be mixed with other manures but sown separately a week or ten days before the seed. In view of the fact that the manufacture is now being undertaken on a large scale and that certain improvements have been effected in the process, it seemed necessary to re-examine the manure from these points of view; its efficiency as a fertiliser being no longer in doubt.

The questions that seemed to require investigation were as follows:—

(1) How far is the material hygroscopic, so that it cannot well be stored under ordinary conditions in bags in a manure store or shed?

We are not concerned with its storage on a large scale by the manufacturer or the merchant, but with the way it would affect a farmer who might have a stock on hand for a month or two before using but who had no special means of keeping it in a dry atmosphere. Assuming further that some moisture will be absorbed, is any loss of fertilising material brought about thereby?

(2) Since calcium cyanamide is made from calcium carbide, which by the action of water gives off inflammable acetylene, is there any danger of the generation of this or other dangerous gases from unchanged carbide remaining in the manure, when it is stored and exposed to damp air?

(3) Can the cyanamide be safely mixed with other manures, particularly superphosphate, or is there a generation of heat or gases to a dangerous or inconvenient extent? At the

same time does either the cyanamide or the superphosphate suffer any loss of fertilising value ?

At the outset it should be borne in mind that calcium cyanamide is slowly attacked by water or by moist air and is converted into ammonia and calcium carbonate, roughly in accordance with the equation—

$$CaCN_2 + 3H_2O = CaCO_3 + 2NH_3.$$

There is, however, in the commercial fertiliser a considerable amount of quicklime, which absorbs water and becomes slaked lime in the usual way ; this slaking of the free lime being the first action that takes place when the crude cyanamide is exposed to moisture. Once the cyanamide has been decomposed there is nothing that will retain the ammonia produced except any excess of moisture that may be present, hence there is always a possibility of loss of the valuable part of the manure, the ammonia, if it is exposed too long to the air ; in the soil the ammonia would, of course, be immediately absorbed by the humus or the clay.

The action of acids upon the crude cyanamide is similar ; a compound of the acid with the quicklime is at once produced with considerable evolution of heat, then the cyanamide is attacked to form compounds of lime and ammonia with the acid in question.

Experimental.—A quantity of calcium cyanamide was supplied to the Rothamsted Experimental Station by the North-Western Cyanamide Company, who are establishing large works in Norway for the manufacture and supply of the manure to north-western Europe. The sample in question came from the works at Piano d'Orte in Italy, where the process is now being carried out on a large scale. It contained, as a mean of several analyses, 17·24 per cent. of nitrogen, and was the usual fine black powder, which had been treated by some special process before export, in order to render it less hygroscopic and easier to handle.

(1) Absorption of water, &c., on exposure.—A series of small quantities (1 gram) of cyanamide was weighed out on watch glasses and placed under a large bell jar over water, thus ensuring the maximum exposure of a thin layer of the manure to the action of moist air. At weekly intervals two watch glasses were withdrawn, and one was weighed in the wet

condition and the second dried in the steam oven. The nitrogen in each sample was then determined and the results are set out in the following table :—

Time of Exposure.	Undried.		Dried.	
	Weight.	Nitrogen Per Cent. on Original Weight.	Weight.	Nitrogen Per Cent. on Original Weight.
	Gram.		Gram.	
Starting	1·000	17·24	...	...
After 1 week ...	1·669	16·87	1·231	16·04
,, 2 weeks ...	1·734	16·30	1·240	15·88
,, 3 ,, ...	1·793	16·18	1·259	15·26
,, 4 ,, ...	1·859	15·97	1·269	15·77
,, 5 ,, ...	2·234	15·85	1·289	15·89
,, 6 ,, ...	2·069	16·17	1·278	...
,, 7 ,, ...	2·431	16·24	1·298	15·13
,, 8 ,, ...	2·508	16·21	1·295	14·92
,, 9 ,, ...	2·802	15·75	1·296	14·52
,, 10 ,, ...	3·235	16·03	1·396	14·69

These results show that the first action of slaking the free lime in the crude cyanamide takes place very quickly when the material is exposed in a thin layer to an atmosphere saturated with moisture, since the weight rises 67 per cent. in the wet condition and 23 per cent. in the dry condition during the first week's exposure. At the same time there is a slight loss of ammonia, though this loss is almost covered by the experimental error inherent in drawing small samples from a powder of variable composition like cyanamide, the difference being little greater than that found between consecutive samples drawn for analysis from the original manure.

With further exposure the cyanamide continues to absorb water until in the end it runs down to a wet paste ; further losses of ammonia in the wet state are, however, small, being in the final sample only 7 per cent. of the total nitrogen with which the material started. The weight after drying increases but little in the latter part of the experiment, because the main reaction causing an increase of weight—the slaking of the free lime—is completed in the first week. The losses of nitrogen in the dried sample increase steadily and amount to about 2 per cent. after the tenth week. These losses are due to the volatilisation during the drying of any ammonium carbonate that has formed.

Other experiments on these lines were made, in which the exposed cyanamide was dried in a current of air that was afterwards passed through acid to absorb any ammonia volatilised ; they confirm the results set out above and show that the action in the first week is almost wholly a slaking of the free lime attended by a slight production of ammonia which is only volatilised as long as the material remains dry. After the slaking is complete the material begins to get damp and may form a cake ; in these later stages larger quantities of free ammonia are produced but only volatilise on drying.

It should be borne in mind that these are extreme cases and that changes of the magnitude of those taking place in the first week would only occur in a manure store after a very long time, so slowly would moisture reach the material inside the bags. It is well known that ground quicklime itself can be stored in bags for some time without serious change. To determine the extent of the change taking place in practice, bags containing 56 lb. each of cyanamide, sulphate of ammonia and nitrate of soda were placed on the floor of the manure shed on 1st August and weighed again on 24th August and 14th October.

	Aug. 1st Lb.	Aug. 24th Lb.	Oct 14th Lb.
Cyanamide	56	$57\frac{3}{4}$	$58\frac{3}{4}$
Sulphate of ammonia ...	56	$56\frac{3}{4}$	$57\frac{3}{4}$
Nitrate of soda	56	$55\frac{3}{4}$	$54\frac{1}{4}$

On 24th August the cyanamide was powdery and in good condition, by 14th October one corner of the bag had burst owing to swelling from the slaking of the lime ; the total gain of weight, however, is only $2\frac{3}{4}$ lb., or about 5 per cent. Now, as under conditions of maximum exposure and complete slaking a gain of 67 per cent. of moisture had only been attended by a loss of 0·37 per cent. of nitrogen, the loss of ammonia when the cyanamide had been stored in a bag and had only gained 5 per cent. in weight would be imperceptible, since we may assume that the loss will be in proportion to the extent of slaking. That the atmosphere of the manure shed had been damp is shown from the fact that the sulphate of ammonia had also gained in weight and caked a little, while the bag of nitrate of soda had become soaking wet, so that the floor

beneath was saturated and a considerable loss of material took place.

It may be concluded that while calcium cyanamide will gradually slake and swell, and suffer a small loss of ammonia on exposure to damp air in bags, yet under ordinary working conditions these losses will be inappreciable, and the manure is no more difficult to store than other artificial manures used by the farmer.

(2) The manufacturers state that they now take special precautions to leave no unaltered carbide in their product, so that the evolution of acetylene from the cyanamide which was noticed with some of the earlier products no longer takes place.

To test the point a current of air saturated with moisture by bubbling through water was led over 20 grams of cyanamide in a flat-bottomed flask and then through a washing bottle containing a solution of ammoniacal silver nitrate of known strength. Blackening of the silver solution slowly took place, and after the air current had been continued for seven days the solution was examined. A very small amount of black precipitate was recovered, and this on testing proved to contain silver acetylide, silver sulphide and a trace of phosphide; the amount recovered was, however, too small for analysis. Assuming that it had all been precipitated by acetylene and calculating from its weight back to calcium carbide the original crude cyanamide contained :—

Experiment 1.—0·048 per cent. calcium carbide.
,, 2.—0·062 ,, ,, ,,

quantities which are negligible.

In another experiment 20 grams of cyanamide were shaken into a large bottle with a little water, and the bottle stoppered and put aside for a day in a warm place. The bottle was then carefully opened and a light introduced; the taper burnt quietly because not enough inflammable gas had been generated to produce an explosive mixture. Since the exposure in both the above experiments was much more severe than could obtain in practice it may safely be concluded that the traces of acetylene, sulphuretted hydrogen and phosphine that will be obtained from the crude cyanamide can be neglected, for they will never become a source of danger or even inconvenience.

The sulphide and phosphide detected doubtless arise from traces of sulphate and phosphate present in the limestone originally employed in the manufacture of the carbide.

(3) In testing the effect of mixing cyanamide with other manures, superphosphate alone need be considered; it is the only manure containing free acid in quantity (dissolved bones being merely a form of superphosphate) so that with it the maximum of chemical action would take place. Only the water contained in other manures would react with the free lime of the cyanamide; further, it is with superphosphate that mixtures would most usually be wanted in practice.

An ordinary commercial grade of superphosphate was used, and three separate lots, each of 2 cwts., were mixed with 11, 22 and 44 lb. of cyanamide respectively. The mixing was done on the stone floor of a manure shed; the manures were weighed out, a layer of superphosphate was spread on the floor and a shovelful of the cyanamide sprinkled over it, then another layer of superphosphate and another shovelful of cyanamide until the whole was mixed. The heap was then broken down, passed through a sieve, the lumps reduced, and the mixing and formation of the heap were repeated four times to secure complete incorporation of the two manures. The heap was then made up, thermometers were put into it and read from time to time; finally, on the next day, the mixture was weighed and put up into bags, which were left in the manure shed and examined at intervals. The mixing was a disagreeable operation because of the light powdery nature of the cyanamide, which filled the air and hung about as a cloud for a long time; it was, however, during the weighing out and the first adding of the cyanamide that this occurred, for as soon as it came in contact with the superphosphate no further dust arose during the rest of the process.

During mixing the heap began to get warm, and with the larger proportions of cyanamide began to steam a little; no offensive gases were, however, given off, so that it was only the first dustiness caused by moving the original cyanamide that caused inconvenience or unpleasantness.

As will be seen from the temperature records a considerable development of heat followed the mixing, due in the main to the slaking of the free lime in the cyanamide and its reaction with

the acid calcium phosphate; the temperature was, however, kept down by the evaporation of the surplus water in the superphosphate and might have been still further reduced, had it been thought desirable, by sprinkling a little water over the mass while the mixing was going on.

To test this point a further experiment was tried in which two separate hundredweights of superphosphate were spread on the floor and 56 lb. of cyanamide was carefully poured on each, covered with the superphosphate and mixed as before. In one case, No. 4, nothing was added to the mixture of two parts superphosphate and one cyanamide, but in the other, No. 5, 2 gallons of water were sprinkled on from a water pot as the mixing went on. This kept the dust down entirely, so that it was possible to complete the mixing without any trouble from the fineness of the cyanamide. The highest temperature reached was 95° (it was a damp cool day with an air temperature of 13° C.), and the wetted heap ran up to this point more quickly than the unsprinkled heap. This was because 1 cwt. of superphosphate does not contain water enough to slake all the lime in ½ cwt. of cyanamide, so that the mixture did not react as strongly as one poorer in cyanamide would have done. Further, with such a small proportion of superphosphate there was not enough acid in it to neutralise all the ammonia produced, consequently a little ammonia could be detected escaping from the steaming heaps both by the nose and by litmus paper.

These latter trials are quoted here to show that sprinkling with water can be used with advantage while making up a mixture of superphosphate and cyanamide, as it keeps down the dust and restricts the rise of temperature without adding any difficulties to the mixing process or causing the final product to cake or set in any way. In the above experiments the material was friable and in a good working condition on the following day.

As will be seen from the weights the heat generated caused the evaporation of a good deal of water, so that the heaps had lost weight considerably when they come to be bagged. There was no tendency to cake shown during the mixing, and on the following day, when the heaps had cooled down, the mixture was still perfectly loose and friable. neither has it

caked at all after lying up in bags for two months and a half. The various mixtures are all light friable powders, rather drier than the original superphosphate and in perfect condition for sowing by hand or drill.

Experiment.	Mixture in lb.		Temperature °C.		Loss of Weight, lb.	
	Cyanamide.	Super-phosphate.	Starting.	Maximum in heap.	After Mixing.	After Storage.
No. 1 ...	11	224	16·5	53	5	12
,, 2 ...	22	224	18	87*	5	12
,, 3 ...	44	224	18	110†	28	29
,, 4 ...	56	112	13	95‡	3	—
,, 5 ...	56	112§	13	93‖	5	—

* After 6 hours. † After 11 hours. ‡ After $2\frac{1}{2}$ hours.
§ Also 20 lb. water. ‖ After 1 hour.

Samples were taken from the first three mixtures and analysed with the following results, in which comparison is made between the figures obtained by analysis and the figures calculated on the assumption that no loss of fertilising material had taken place, after due allowance had been made for the shrinkage in weight due to the loss of water on mixing.

	Nitrogen.		Phosphoric Acid.		
			Water Soluble (Found).	Citric Acid Soluble.	
	Calculated.	Found.		Calculated.	Found.
Cyanamide ...	—	17·24	—	—	—
Superphosphate	—	—	11·48	—	12·68
Mixture I ...	0·864	0·852	6·66	12·35	11·65
,, II ...	1·540	1·630	1·65	12·14	11·22
,, III ...	3·080	3·054	—	11·88	10·57

Allowing for the errors introduced by mixing and sampling, these results are quite consistent and lead to the following conclusions :—

(1) There is no loss of nitrogen; any ammonia that is generated on the slaking of the lime is at once fixed by the superphosphate. This conclusion is confirmed by the observation that not the least smell of ammonia could be detected during mixing or arising from the heap after mixture, except in mixtures 4 and 5 where an excess of cyanamide was used.

(2) The water soluble phosphoric acid in the superphosphate is rendered insoluble in proportion to the amount of cyanamide introduced. As would be expected, the free lime of the cyanamide combines with the soluble calcium phosphate in the superphosphate to form a calcium phosphate insoluble in water. A mixture of 1 part cyanamide to 10 parts superphosphate precipitates most of the soluble phosphate, when the mixture is raised to 1 to 5 all the soluble phosphate has been converted into di-calcium phosphate.

(3) The amount of citric acid soluble phosphate (determined by the official method of shaking for half an hour with 2 per cent. citric acid solution*) undergoes little change from the mixing. Evidently the reaction between the slaked lime from the cyanamide and the soluble phosphate gives rise to di-calcium phosphate, the usual precipitated or "reverted" phosphate which is completely soluble in citric acid solution. Very little change to tri-calcium phosphate is brought about either by the lime or the heating.

From the fertiliser point of view, then, the mixture of cyanamide with superphosphate occasions no loss of nitrogen, but more or less of the phosphoric acid ceases to be water soluble, remaining, however, as the readily available di-calcium phosphate. While the precipitated phosphate cannot be regarded as of quite the same value as water soluble phosphate, the falling-off in fertilising value is slight.

Various attempts were made to ascertain how much of the nitrogen of the original cyanamide had been converted into ammonium salts in the mixed manures; the results were, however, unsatisfactory owing to the fact that the unchanged cyanamide is itself continuously decomposed when distilled with magnesia. They indicated, however, that little formation of ammonium salts had taken place.

Some experiments were also made to see if any quantity of the dicyanodiamide, which is said to be poisonous to plants, had been produced in the mixture. Six pots were made up, each containing about 3 kilos. of sand, and, in addition to potassium

* The citric acid solution is used to discriminate between phosphates which are readily soluble in soil water, such phosphates as are found in basic slag or basic superphosphate or are produced in the soil by the application of superphosphate, and on the other hand, the unchanged phosphate of lime which is practically insoluble in the citric acid.

sulphate and other nutrient salts, 0·3, 3 and 6 grams respectively of mixture No. 3 were added to the pots with an appropriate amount of water, and young barley plants were planted in each pot. The experiment was started too late in the year to be pushed to a conclusion, but in all cases the barley grew, though not very freely where 6 grams (= 0·2 per cent. of the whole contents of the pot) had been added. However, such an amount is excessive in a sand culture, and the mere fact that the barley grew for three months in contact with so large a proportion is evidence that nothing that would be poisonous to plant life in practice had been formed in the mixture.

From our experience in making up these mixtures I should be strongly inclined to recommend farmers using cyanamide to mix it before sowing; it will mostly require to be used with a phosphate, and it is much less trouble to mix cyanamide with superphosphate in a manure shed than to deal with it in the open. It would be practically impossible to sow cyanamide by hand, and even a machine would result in great waste and unpleasantness to the men except on the stillest of days; but after the first spreading of the cyanamide on the floor is over, mixing with superphosphate presents no further inconveniences, and the resulting mixture is easy to handle and can be dealt with like any other artificial manure without even the waiting period before seeding that is recommended when cyanamide is sown alone.

The net conclusions from the above experiments are that calcium cyanamide as now manufactured can be stored for a reasonable time under ordinary conditions without danger or sensible loss of its fertilising properties; cyanamide can also be mixed without difficulty or loss with superphosphate, the resulting mixture being as easily handled as any other artificial manure.

THE PRUNING OF THE PEACH.

WALTER P. WRIGHT.

The peach (*Prunus persica*, Order *Rosaceae*) is closely allied to the almond, the apricot, the cherry and the plum. So fine, indeed, are the botanical distinctions between them, that modern botanists refuse to retain *Amygdalus*, *Armeniaca* and *Cerasus* as separate genera, and prefer to class them

all under *Prunus*; but practical horticulturists are compelled to draw a wide distinction between peaches and the sister fruits just named, for cultural reasons. One of the most important of these is pruning. The fruiting system of the peach is dissimilar from that of the apricot, the plum and the "heart" cherries, consequently a different method of pruning is required.

Broadly, the peach (with which is included the nectarine) is a young wood fruiter, and the others are "spur" fruiters; that is to say, the peach bears its fruit on the long, slender

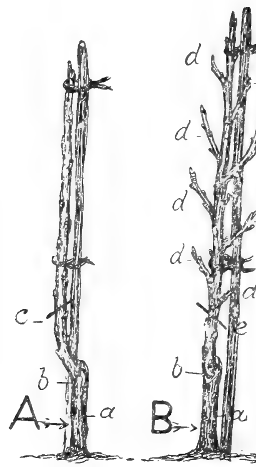


FIG. 1.—Maiden tree (one year old from the bud):—(A), moderately vigorous, with firm, well ripened wood: (*a*), stock; (*b*), junction of stock and scion (bud); (*c*), point of shortening to five buds. (B), a stronger tree, but somewhat gross and the wood immature (very liable to gumming): (*d*), laterals; (*e*), point of shortening to unstarted buds on firm, ripened wood. Tree (A) is a better type than tree (B), but both will succeed if pruned hard as shown.

side shoots (collectively described as "breast-wood"), that push from the main branches; and the apricot, "heart" cherry and plum bear fruit on the short, generally older outgrowths of the main stems, which gardeners call "spurs." It is true that peaches may be manipulated in such a way as to induce them to fruit on spurs, and this method is adopted with pot trees. It is also true that "heart" cherries, plums sometimes, and apricots often, bear on young wood; but these are the exceptions, not the rule.

Believers in non-pruning argue that a fruit tree which bears on young wood merely requires to be left to grow, and

point to the Morello cherry, which, with a similar fruiting system to that of the peach, bears prodigiously when unpruned. But a tree untouched by the knife would become crowded with shoots, which, as they grew older, would become barren. The real fruiting wood would become weaker and weaker with each successive year, and eventually the fruit would be valueless. So far from the peach requiring no pruning, it needs a regular routine of cutting if it is to bear heavy crops of fine fruit every year.

The first object of the grower should be to form a framework of healthy, clean, main branches, on which to produce his annual crop of fruiting "breast-wood." The ribs of an expanded fan form a simple parallel for the form of this skeleton tree. Springing from a common centre, or "leader," and secured to their support in regular ranks about a foot apart, these "ribs" provide the foundation of the fruiting system. The formation of the tree is so closely bound up with the question of pruning that it will be wise to begin at the beginning, and consider how a peach tree is formed. It is raised, in the first place, from a bud inserted in the main stem of the "stock" in the summer (the Almond, Mussel, St. Julien and Myrobalan are the most popular "stocks"). Growing from the bud to the length of several feet the following season, it reaches what is known as the "maiden" stage.

Early Pruning.—The maiden peach must be cut back severely before it starts growing the next season, otherwise it will be impossible to get a tree with a good foundation. Impatient growers, anxious to see a large space covered in the shortest possible time, sometimes omit the shortening, but the result is never satisfactory. The upper buds break into growth strongly, but the lower ones either do not break at all or do so very weakly. In a year or two the tree is completely bare of fruiting wood at the base, and a considerable area of wall or trellis space is wasted.

It has been said that the shortening must be severe. This is a general term, and it may be well to be more exact. The maiden tree may be cut to five buds, and the branches resulting from the heading may all be cut back to about one-half of their length the following season. If the soil is good, and the trees are healthy, the buds on the stumps left

will break very strongly, and two may be selected from each for growing on. The tree has now double the number of branches that it had prior to the shortening, and during the subsequent growing season they will extend steadily.

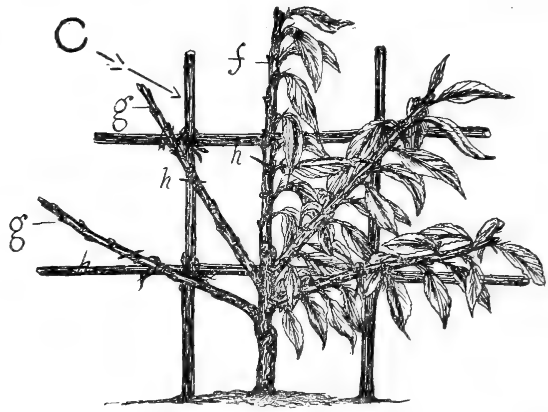


FIG. 2.—Second year tree :—(C), tree A fig. 1, with five shoots, usual form of fan-trained tree, but not a true old English fan, which has no leader ; (*f*), leading or central shoot ; (*g*), side shoots to form branches, all others being rubbed off while quite small ; (*h*), points of shortening to cause strong growths to push at the desired points.

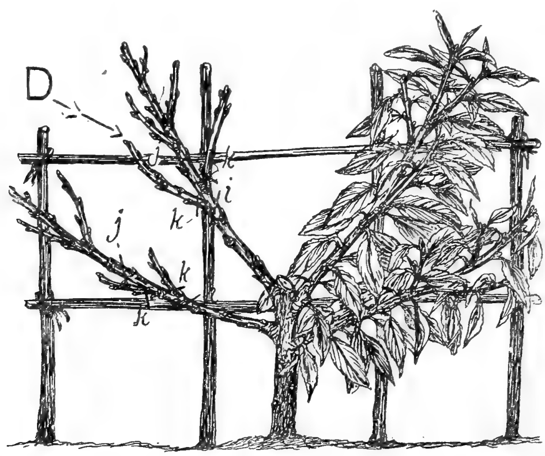


FIG. 3.—Second year tree :—(D), tree B [fig. 1, with four strong shcots, which have pushed laterals : (*i*), points of shortening to unstarted buds ; (*j*), points of shortening ; (*k*), points of cutting off laterals.

Soil.—The extent to which they will develop may be expected to depend upon the soil. Successful peach growers do not find it desirable to employ a very rich soil for this fruit. Heavily manured soil means gross growth, which has to be

corrected by root pruning before a fruiting habit is secured. A grower who finds that his trees are making summer breastwood four or five feet long, and from half an inch to an inch thick, should certainly lift the trees and prune the roots; but inasmuch as this operation takes up valuable time, he should take care to avoid the necessity for it in future plantings by using a compost containing less manure. It is generally found that turfy loam, with a barrow load of lime rubbish to every cartload, gives the right kind of growth. The wood resulting from such a compost is neither puny nor luxuriant, but is of medium strength and well furnished with flower buds.

Subsequent Pruning.—Returning to the formation of our tree, we find that at the end of the second season the lower part is well furnished; but further extension is needed, and this is best secured by yet another shortening. The third cutting back need not be anything like so severe as the first and second were. It will suffice if the branches are shortened to the extent of one-third.

We see, then, that the framework of the tree is secured by three prunings: (1) the heading back of the maiden tree, (2) the severe shortening of the second season tree, (3) the moderate shortening of the third season tree. Further cutting back will not be necessary unless the tree is weak, or there is a great extent of space to be covered. Indeed, the grower must guard against excess in shortening, or it may lead to overcrowding of the main branches—and this is a thing to be avoided. They ought to be about a foot apart, as this permits of the fruiting breastwood being tied in between them without any crowding.

Breastwood.—The management of the breastwood should now engage attention, and whether the trees be trained to walls, roof wires or trellises the procedure is the same. The object of the cultivator is to provide an annual succession of summer shoots, in order that the growths which have borne fruit may be cut away, and their places taken by new ones. Not only should there be a sufficient number of new growths every year, but they should be of a certain degree of vigour. If they are very thick and long they are too gross and sappy to form plump fruit buds; if very small they bear poor fruit.

Making allowances for the differences between varieties, it may be said that shoots fifteen to eighteen inches long, about as thick as an ordinary penholder, firm and partly browned over by August, are the best. Such wood generally forms plenty of buds, and bears fruit of high quality. The grower will get it if he prepares suitable compost, plants good trees, and takes care that his general culture is right. It is particularly important to keep down black aphis. If this is allowed to establish itself in the tips of the shoots in spring the crop of fruiting wood for the following year will be a bad one. Quassia

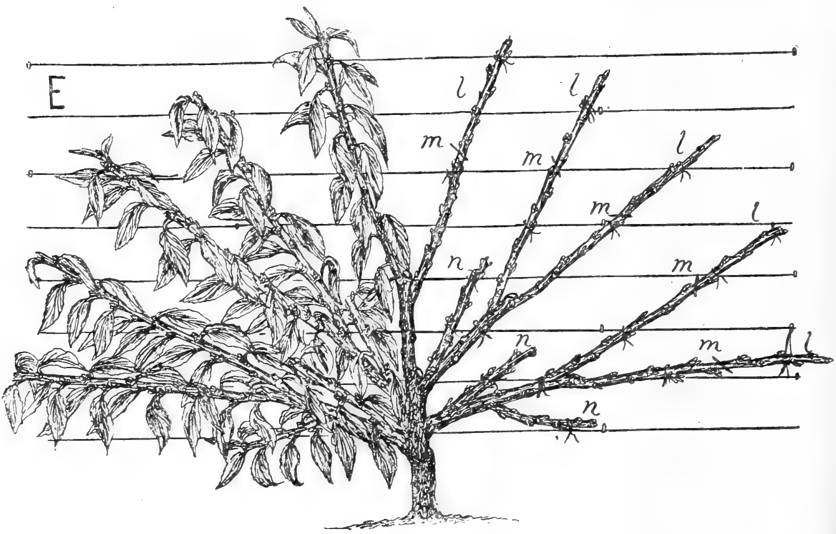


FIG. 4.—(E), third year tree, fig. 2, C: (l), extension growths (laterals, if any, being pinched at the first joint, and at the winter pruning cut clean off to the shoot); (m), points of shortening the extensions; (n), bearing shoots, not closer than 1 ft. on the extensions, stopped at 12 to 14 in. length, and cut back to firm, ripe wood and to a wood bud at the winter pruning.

water, tobacco water or paraffin oil emulsion will destroy it. Blister must also be avoided, and it rarely gives trouble if the plants are protected from cold draughts.

The tying in of the summer wood cannot take place until the current year's crop has been gathered, but it may be done at the first favourable opportunity after the picking of the fruit is complete. There will probably be a great many more shoots than are required to fill the places of those cut out, and in going over the trees in order to make a selection first dispense with those which stand out from the front of the branches at right angles to the wall. These are called "foreright" shoots,

and should not be used except in case of emergency, because it is difficult to tie them in neatly in regular lines. As far as possible a choice should be made from amongst the shoots of medium strength that grow parallel with the face of the support.

When the shoots have matured and cast their leaves, it will be found, on examining them, that they contain different kinds of buds. There will be small, pointed, single buds, which are growth buds pure and simple ; there will probably be buds in pairs, one of which may be a plump fruit and the other a narrow wood bud ; and there will be buds in threes, two of which are likely to be fruit buds and the third a wood bud. Each shoot of the right kind will contain at least one cluster of triple buds, and probably it will contain several.

Disbudding.—With the commencement of growth the following year will come the process of disbudding, which is a form of pruning. The necessity for disbudding arises from the fact that the various wood buds on the fruiting shoots will begin to push, and if allowed to extend will soon crowd the tree and rob the fruit. The great majority of them will have to be removed, and it is advisable to take them away while they are quite small. It is a good plan to spread the operation over a few days, in order to avoid causing a check ; indeed, such a course may be rendered imperative by the buds breaking at different periods. Two shoots may be left, one near the tip, the other at the base. The former will encourage a free flow of sap up the shoot, and so aid the swelling of the fruit. It must not, however, be allowed to extend very far ; the best thing is to nip off the end after three leaves have been formed, and if fresh growth starts stop it at the first leaf.

The basal shoot is the more important one. It is this which is to form the fruiting shoot of the next year, when the one now about to bear has done its duty and been cut away. It must be allowed to grow unchecked, and kept free from insects and fungi. Should it threaten to extend more than two feet the end may be nipped off, and any subsequent growths which push as a result of this pinching stopped at the first leaf.

The system of pruning recommended applies to all peaches

and nectarines grown against walls or trellises, whether indoors or out. Trees grown in pots should be treated somewhat differently, as it would not be convenient to tie in a mass of young fruiting shoots. The fact that peaches will form spurs has been mentioned, and this may be taken advantage of

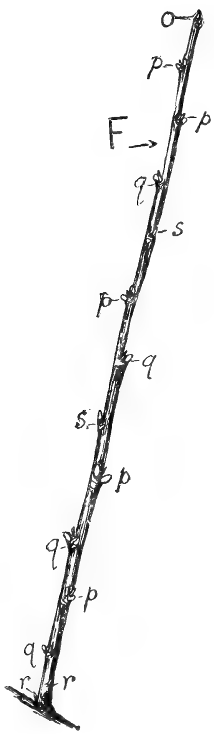


FIG. 5.—Fruiting shoot with various buds: (*o*), terminal wood bud; (*p*), triple buds (two blossom buds with wood bud in the centre); (*q*), double buds (one blossom bud and wood bud); (*r*), basal wood buds; (*s*), wood buds without blossom buds.

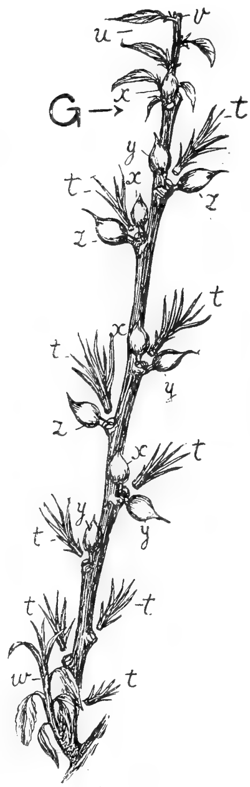


FIG. 6.—Disbudding: (G), a bearing shoot: (*t*), disbudded growths; (*u*), growth to attract sap to the fruit; (*v*), point of pinching to the third good leaf; (*w*), successional bearing shoot, not to be stopped; (*x*), fruit to be removed at the first thinning; (*y*), fruit to be rubbed off at the second thinning; (*z*), fruit left for the crop.

in the case of pot trees. It is not suggested that young wood should be completely suppressed, as in pears, but that a combination of young wood and spur pruning should be adopted. Any short, stubby shoots which form should be stopped at the second leaf, and they will form fruit buds at the base.

SUMMARY.—*Tree Formation.*—(1) The maiden is shortened to five buds at the end of the first season's growth; (2) the resulting shoots are shortened to about one-half of their length after another season's growth; (3) a third shortening to the extent of one-third is practised.

Fruiting Shoots.—(4) Young wood from the main branches is selected, and tied to the wires between them; (5) in spring all the growth buds are removed except one at the base and another at the tip; the former is allowed to grow, the latter is stopped; (6) after the fruit has been gathered the shoots which have borne it are removed, and the young shoots from the base are tied in in their place; (7) pot trees may be encouraged to form spurs.

Treasury Minute under the Small Holdings Act.

The following is a copy of a Treasury Minute dated 31st December, 1907, issued in pursuance of the provisions of section 5 (4) of the Small Holdings and Allotments Act, 1907, as to the payment out of the Small Holdings Account of a contribution towards any loss which may be unavoidably incurred in carrying out a Scheme for the provision of Small Holdings under that Act.

The Chancellor of the Exchequer calls the attention of the Board to section 5 (4) of the Small Holdings Act of last Session, which is in the following terms:—

> "If it appears to the Board (of Agriculture and Fisheries) that the carrying out of a scheme under this Act has resulted or is likely to result in a loss, the Board may, with the consent of the Treasury, pay or undertake to pay out of the Small Holdings Account the whole or any part of that loss."

The Chancellor of the Exchequer further states that, in the Debate on the Small Holdings Bill on the 12th August last, he authorised the First Commissioner of Works, who was in charge of the Bill, to inform the House that, in cases in which a Local Authority in carrying out a scheme under the Act had incurred a loss, one half of such loss would, subject to enquiry by the Treasury, be paid from Public Funds, provided that the Board of Agriculture and Fisheries were able to certify that the Authority in question had acted reasonably, and with due precaution, and that the loss was irrecoverable.

In the absence of any experience of the working of the Act, the Chancellor of the Exchequer does not think it possible to define very closely the circumstances in which Public Funds will be called upon to provide for such losses. If the proceedings of the Local Authorities are conducted with ordinary discrimination and prudence, no losses should be incurred. But if, after all reasonable precautions have been taken, an unavoidable loss ensues, the Chancellor of the Exchequer thinks that the taxpayer may fairly be expected to share it to the extent of one half.

He therefore recommends the Board to accept the liability above indicated, subject to the following regulations and conditions:—

(1). Any Local Authority desiring to claim a grant should make application to the Board of Agriculture and Fisheries.

The application should be accompanied by an Account of the Income and Expenditure of the Local Authority in respect of the scheme for the period to which the claim relates, and a Balance Sheet showing the assets and liabilities of the Authority in connection therewith.

(2). The Board should certify that they are satisfied—

(i) that the loss cannot reasonably be expected to be recouped out of receipts from the future working of the scheme;

(ii) that the loss is not due to (*a*) excessive price or rent agreed to be paid by the Council, (*b*) unreasonable expenditure on equipment, (*c*) insufficient care in selection of tenants and the subsequent supervision of their proceedings, (*d*) an undue proportion of the general Small Holdings expenses of the Council being charged to the scheme;

(iii) that the Council have in the case of holdings let used their best endeavours to obtain rents fixed at amounts which might reasonably be expected to be sufficient to recoup to the Council all expenses incurred in the acquisition of the land (including repayment of capital where the land is purchased) or in the adaptation or subsequent management of the land;

(iv) that the Council have in the case of holdings sold conformed with the requirements of the Small Holdings Acts;

(v) that the Council have taken full advantage of their borrowing powers;

(vi) that the Council have acted reasonably in carrying out the scheme;

(vii) in the case of loss on a scheme prepared under section 3 (3) of the Small Holdings and Allotments Acts, 1907, that the total receipts of the Council under the Small Holdings Acts for the current financial year (with any balance of such receipts brought forward from the previous year) will be insufficient to defray their expenditure under the said Acts unless the Council receive the contribution applied for.

(3). The Treasury reserves a right to make independent enquiry into the circumstances if it thinks fit.

Blindness in Barley.

The disease known as "blindness" (*Helminthosporium gramineum*) in barley and oats has been described in this *Journal* (September, 1905, Vol. xii., p. 347), and the treatment recommended was the sprinkling of the seed with 1 per cent. of formalin in water, thoroughly turning and mixing the grain so that all of it comes in contact with the solution. Treatment of the seed with copper sulphate or by steeping it in hot water was also mentioned.

According to some experiments described in Farmers Bulletin, No. 5, issued by the Agricultural Department of Cambridge University, seed dressed with 10 per cent. copper sulphate was found to germinate slowly, so that the crop was several days later and more irregular than the others. Formalin had no bad effect upon the seed and was nearly as effective, while treatment with "SAR" (a mixture of sulphur, alkali and resin, see *Journal*, August, 1906, p. 289) and Jensen's hot-water method (see Leaflet 92) were much less effective.

In 1907, formalin was again used at two strengths. In the

proportion of 1 part to 240 of water, 2·5 per cent. of diseased plants were found, while seed treated with a solution of 1 part to 160 of water yielded only ·9 per cent. of diseased plants. The stronger solution had no bad effect upon the crop, while by checking the disease it increased the yield of grain by no less than 25 per cent., and also greatly raised the proportion of "head" to "light" corn. One pint of formalin mixed with 20 gallons of water gives the required strength.

Warning against the use of Damaged Seed.

In view of the unfavourable weather at harvest time in Scotland last year, the Board think it desirable to draw the attention of farmers in the North to the danger of sowing damaged seed. In 1904 the low germinating power of much of the grain saved for seed in Aberdeenshire was pointed out, and experiments were carried out by Mr. R. B. Greig of the Agricultural Department, Marischal College, Aberdeen, with a view to ascertaining how far the unseasonable harvest weather of 1903 had affected the vitality of the oats intended for seed in 1904. (See *Journal*, July, 1904, Vol. xi, p. 217). Among a number of samples which were intended for seed, but which were not specially selected, it was found that in six samples which had been three weeks in stook in rainy or misty weather, the average germination was 40 per cent., in eight samples four weeks in stook, it was 33 per cent., and in six samples five to six weeks in stook, it was 29 per cent.

Farmers should therefore be careful to avoid sowing seed from grain which has been long exposed to bad weather, and it will probably be found desirable to purchase grain from localities where harvest conditions last year were moderately favourable. Home-grown seed should have its germinating power tested, and should be sown more thickly than usual.

The following note on the subject of "Mildew on swedes" has been communicated to the Board by Mr. Thomas Milburn, Ph.D., of the Midland Agricultural College.

"Mildew" of Swedes.

Both true and false Mildew of swedes are caused by minute thread-like organisms. These bodies are in reality

very small plants, which live on the surface of, or within, the leaves, and form a greyish white covering on the outside. They draw their nourishment from the leaves, and so give them a sickly appearance.

Serious complaints of "mildew" were made by farmers in the Midlands during September (1907), and an examination of a number of affected crops was made. Mildew was found in most cases, but the bulk of the damage resulted from another, and quite different, cause, viz., an aggravated attack of aphides (green fly or smother fly). In many cases the whole swede area was badly infested, while in others only certain patches suffered seriously. Even in the most healthy looking crops, however, these insects were to be found in groups on the underside of the leaves. Where the attack was bad the leaves, the ground below, and the aphides themselves were covered with a bluish white dust. This gave, to a casual observer in the distance, the appearance of either true or false mildew, though on closer examination no farmer could possibly have confused the smother fly with mildew. As in the case of mildew, the early sown crops appear most susceptible; indeed there seems little fear of devastation where late sowing is resorted to; for cool moist weather occurs before serious harm is done.

At a farm in Derbyshire, swedes were grown alongside cabbage. The cabbage suffered seriously during the summer from smother fly, and on account of their sickly appearance were top-dressed with nitrate of soda. After this dressing the cabbage grew well and the amount of smother fly diminished, but the adjoining rows of swedes showed distinct signs of being affected. At the beginning of October the smother fly had seriously damaged the first fourteen to twenty rows, while the leaves of the rest of the crop were perfectly fresh, although sown and manured in the same way. It seems clear that the affected rows suffered owing to their proximity to the cabbage, and a similar result has been noticed at other farms where no nitrate of soda was applied. It would be well to separate cabbages and swedes by sowing a few rows of mangels between them.

In the swede variety trials carried out by the Midland Agricultural College, certain varieties were noticed to be more susceptible than others to the smother fly. Ten varieties

were grown. Pioneer and X-L-All were not attacked, while Defiance, Queen, and Elephant varieties suffered seriously.

Where a crop is so badly attacked that little hope of recovery can be entertained it might be an advantage to cut off the tops, thereby encouraging the formation of young shoots. Some farmers do this with successful results, but further evidence is required before this course can be recommended.

Much damage is done by these aphides, and in the light of the above observations it seems advisable (1) to discriminate between aphis and mildew attack, (2) to sow later in dry districts, (3) to grow those varieties which are noticed to be least susceptible, (4) to sow a few rows of mangels between cabbages and swedes, and (5) to note the effect of top-dressings.

Caution to Purchasers of Home Produce.

The attention of the Board of Agriculture and Fisheries has been drawn to a case, which, in their opinion, deserves publicity as an example of the way in which persons who desire to purchase home produce may be misled by the terms of advertisements or trade names, which may have been issued or used without any breach of the law, and without any intent to deceive the public.

The advertisement in the case in question was in the following terms:—

"Special Xmas offer by the Curers to the Consumers of

TEN THOUSAND HAMS.

Deliciously mild and silky cutting. Weight between 10 lbs. and 12 lbs. Smoked or unsmoked; state which. Sent carriage paid to any part of the country on receipt of Postal Order, crossed Barclay & Co., for—

EACH 6/6 EACH.

This is an exceptional chance of dealing direct.

Take it Now.

Address: Dept. 'C,' London Office, CUMBERLAND HAM Co., 5, York Buildings, Adelphi, London, W.C."

The Board, having reason to believe that the hams so advertised were not English hams, wrote to the Cumberland Ham Company, and the following correspondence took place :—

4, Whitehall Place, S.W.
9th January, 1908.

SIR,

I am directed by the Board of Agriculture and Fisheries to inform you that their attention has been drawn to an advertisement, a copy of which is enclosed, which appears to relate to American hams, or at any rate to hams that in no sense are "Cumberland hams." In the absence of explanation, it appears to the Board that the adoption of the style "Cumberland Ham Company," for the purpose of carrying on a business in hams that are in no sense "Cumberland" hams, is calculated to create a false impression in the minds of the public as to the nature of the hams offered for sale; but before taking further steps with a view to stopping this and warning the public against the risk of being misled by the name you have adopted, the Board would be glad to consider any explanation which you may desire to offer.

I am, &c.,
(Signed) T. H. ELLIOTT,
Secretary.

The Cumberland Ham Co.,
5, York Buildings, Adelphi, W.C.

5, York Buildings, Adelphi, W.C.
10th January, 1908.

DEAR SIR,

We are in receipt of your communication of yesterday's date, and should be glad if you would be good enough to inform us under what authority, statutory or otherwise, the Board of Agriculture and Fisheries asks for an explanation with regard to the name adopted by this Company.

We are, &c.,
THE CUMBERLAND HAM CO.

The Secretary,
The Board of Agriculture and Fisheries.

4, Whitehall Place, S.W.
18th January, 1908.

GENTLEMEN,

I am directed by the Board of Agriculture and Fisheries to advert to your letter of the 10th inst., and to inform you that the Board are invested by statute with the power of taking action to prevent misdescription, direct or indirect, of agricultural produce, and the action they have under consideration has this object in view. The Board, in accordance with their usual practice, gave you an opportunity of making any statement you thought fit, and no statutory authority is necessary to enable them to do so.

I am, &c.,
(Signed) R. H. REW,
Assistant Secretary.

The Cumberland Ham Co.,
5, York Buildings, Adelphi, W.C.

5, York Buildings, Adelphi, London, W.C.
22nd January, 1908.

DEAR SIR,

We beg to acknowledge receipt of your favour of the 18th inst., and in reply to say that this Company, which has been established as the retail branch of a large firm of curers, deals in Cumberland, Irish, Canadian and American hams, and that the hams referred to in the advertisement you sent us a copy of, were not advertised or sold as Cumberland Hams, the price at which they were offered preventing any possibility of such a suggestion.

We have received, and continue to receive, a large number of repeat orders.

Would it be the contention of the Board that the title of this Company precludes it from selling any but Cumberland hams?

If the Board of Agriculture and Fisheries take any steps detrimental to the business of this firm, we shall at once take steps to protect ourselves.

Yours faithfully,

THE CUMBERLAND HAM CO.

The Secretary,
The Board of Agriculture and Fisheries.

The Board have no reason to suppose that the information furnished to them by the Company is in any way incorrect, but they are not satisfied that in this case customers, by observing the price at which the hams were offered, would be prevented from arriving at an erroneous conclusion as to the origin of the hams.

The name "Cumberland Ham Co." is suggestive either of a Ham Company connected with Cumberland, or of a Company connected with Cumberland hams, and any person having no special knowledge of ham prices might not unreasonably think that the Company who inserted this advertisement was a Company dealing only in Cumberland hams.

Other instances of trade names which might in a similar way lead to misconception have been brought to the notice of the Board, and as the Board are advised that there is nothing illegal in the adoption of these names, they would impress upon persons who desire to purchase home produce that they should attach no importance to any indication of origin afforded by a trade name, but should specifically order home produce.

The Currant Bud Mite and the Hazel Bud Mite.

The *Eriophyidæ* are a family of mites, the members of which are feeders on plants. Some of them live on the surface of the attacked tissue, some live in buds, which may swell as a result of their presence, some cause a curling of the leaf, and some give rise to projecting galls or malformations on leaves and more rarely on twigs.

The Black Currant Bud Mite (*Eriophyes ribis*) and the Hazel Bud Mite (*Eriophyes avellanæ*) live in each case in the buds of the respective plant, and as a result of their presence infested buds swell greatly.

Every now and again there is a recurrence of the statement of the belief that the Hazel Bud Mite (*E. avellanæ*) can pass to, live in and cause to swell, the buds of the black currant, and that thus black currant bushes may become infected from neighbouring hazel or nut trees. This is an echo of an old controversy dating from early in last century, when workers on these mites joined issue with one another as to whether the same mite could make more than one kind of gall; or give rise to a gall on one plant and no gall on a different kind of plant; or whether the same species of mite could be found in the same kind of gall on plants with little relationship to one another. Thus the same mite was recorded as found in one kind of gall on the leaves of the lime tree and on the willow and in the swollen buds of the hazel.

The difficulties and disputes have been due partly to faulty observation; to insufficient magnification of the mites before the perfecting of the compound microscope; to the extreme minuteness of the mites—for only a few of them reach one-hundredth part of an inch in length, and to the difficulty of the characters, which are made the basis of distinction and separation of species—such characters as the number of bristles, the position of the bristles, the sculpturing and striations of the dorsal shield, and the shape of the ventral plate.

The great worker in recent years on the genus *Eriophyes* is Nalepa of Vienna, who has given detailed descriptions and figures of many species. From Nalepa's work the Black Currant Bud Mite and the Hazel Bud Mite stand as valid and separate species. As far as I know there are no records beyond dispute of the Black Currant Mite having been found in swollen buds of the hazel, although Mr. W. E. Collinge has recorded* finding on two occasions in black currant buds infested with the Black Currant Bud Mite a few examples of the Hazel Bud Mite. Mr. Cecil Warburton, with hazel mite common in his garden, has never found any in his black currants. An occasional *avellanæ* found in black currant buds proves nothing. What requires to be proved is that "big bud" in currants has been due to *E. avellanæ*. It must be remembered that identification of the two mites needs a high power of the microscope.

* *Proceedings of the Association of Economic Biologists*, Vol. 1, July, 1905, p. 11.

I give below, placed in parallel columns for the sake of reference, a translation from Nalepa's work on *Eriophyidæ* of the distinguishing characters of the two species :—

HAZEL BUD MITE. (*Eriophyes avellanæ.*)	BLACK CURRANT BUD MITE. (*Eriophyes ribis.*)
The dorsal shield (on the front region of the body, known as the cephalo-thorax) triangular, rounded in front, and traversed by a not very prominent longitudinal line.	The dorsal shield is almost triangular; its middle region has five longitudinal lines, and the side portions are coarsely punctured and traversed by wavy lines.
The shield has short dorsal bristles directed outwards, inserted in front of the hinder edge, and a second shorter pair at the side.	The shield has no dorsal bristles.
Joints 4 and 5 of the legs approximately equal in length.	Joints 4 and 5 of the legs about equal in length.
The bristles on the small process at the end of the leg are four-plumed or four-rayed.	The bristles on the small process at the end of the leg are five-plumed or rayed.
The sternum (the region on the under surface, where the epimera or plates that fix the legs to the thorax meet) not forked.	The sternum forked.
Setae Laterales short and fragile (these are the first pair of bristles borne by the abdomen; they are situated one on each side, on the under surface, about level with the sexual apparatus).	
Setae Ventrales I short; the same length as the setae laterales (setae ventrales I = the pair of bristles some distance behind the setae laterales, and springing not from the edge but from the under surface of the abdomen.	Setae ventrales I long; much larger than the setae laterales.
Setae ventrales II (the next pair of bristles) very short.	Setae ventrales II short.
Setae ventrales III somewhat longer than setae ventrales I (they are almost at the hind end and spring from the under surface).	Setae ventrales III short, but rather longer than setae ventrales II.
Tail bristles short.	Tail bristles very long.
The abdomen has on its upper surface behind the shield a pair of bristles.	No such bristles.
Epigynium (the ventral plate, situated on the under surface of the abdomen behind the legs), half globular and smooth.	The ventral plate is grooved.
Male measures 180 micros long, 40 micros broad; female measures 210 micros long, 50 micros broad. A micro = $\frac{1}{25000}$ inch.	Male measures 150 micros long, 38 micros broad; female measures 230 micros long, 40 micros broad.

Summarising our present knowledge of the genus *Eriophyes* we may say :—

1. That the species of the genus *Eriophyes* to a great extent confine themselves each to one food plant.

2. That some species of the genus *Eriophyes* are found feeding each on several species of the same genus of plant.

3. There are recorded cases of a species of *Eriophyes* attacking plants of different genera of the same natural order.

4. That examples of the same species of *Eriophyes* infesting plants of a different but related natural order are so rare as to be exceptional.

It still remains to prove from microscopic examination and experimentally that the same species of mite will infest plants of two different and not related natural orders, giving rise on these plants to the same kind of gall or damage.

R. STEWART MACDOUGALL.

The Bulb Mite (*Rhizoglyphus echinopus*).

In reference to the article on the Bulb Mite (*Rhizoglyphus echinopus*) which appeared in this *Journal* for March, 1905, the methods of treatment there given have now been revised and should read as follows :—

1. This pest is very difficult to combat because the extremely tiny mites feed not only on the outside of the bulbs, but between the leaf scales of the bulb, feeding and laying their eggs in the interior, where they can scarcely be reached. The best plan is to burn badly infested bulbs, for the mites which have penetrated into bulbs cannot be reached. Infested soil should not be used for other bulbs.

2. In the case of mites which are more external the bulbs should be sprayed with paraffin, the treatment being repeated a fortnight later ; or the bulbs may be washed in sulphide of potassium (liver of sulphur), 1 oz. to 1 gallon of water, or brushed with this after removal of the outside scale leaves. This treatment is useful against fungi which follow the attack of the mite.*

---

* At a meeting of the Scientific Committee of the Royal Horticultural Society (see *Gard. Chron.*, Dec. 20, 1902, p. 465), Mr. Saunders, in the course of a report on hyacinth bulbs containing a large number of *R. echinopus*, stated that "When bulbs are thus infested with these mites nothing can be done to save them. When only a few mites are at the base of the bulb, where the attack generally commences, they may be killed by immersing the bulbs for five minutes in water at a temperature of 115° to 120° Fahr. If some sulphide of potassium (6 oz. to the pint) be added to the water, this remedy would be all the more efficacious ; indeed it is said that soaking the bulbs in this solution cold for twenty minutes will kill the mites."

3. Infested bulbs may be fumigated with bisulphide of carbon. The bulbs to be treated should be placed in an air-tight receptacle, and a saucer, containing the bisulphide of carbon should then be placed on the top of them, and the receptacle closed. The bulbs should be left in the vapour for forty-eight hours. This treatment could be usefully extended to imported bulbs, which ought to be examined for the mite. The formula for fumigation on a larger scale is one pint of bisulphide of carbon to 1,000 cubic feet of space. Bisulphide of carbon fumes are very poisonous, and should not be breathed, and no naked light (the operator, for example, should not be smoking) must be brought near them.

A revised Leaflet (No. 136) on this pest has now been issued, and may be obtained free of all charge on application to the Secretary, Board of Agriculture and Fisheries, 4, Whitehall-place, S.W.

Gooseberry Black-Knot.

The fungus (*Plowrightia ribesia*, Sacc.) causing this disease is closely related to *Plowrightia morbosa*, Sacc., the widely distributed "black-knot" of plum and cherry trees in the United States and Canada.

P. ribesia attacks the stem and larger branches of the gooseberry and of the red and black currant bushes in this country, and it is not uncommon to find the disease in neglected gardens, more especially where currant scale or aphides are present in quantity. The fungus is a wound-parasite, since spores placed on an unbroken surface produce no result, whereas infection follows when spores are placed in a minute wound in the bark. It seems probable that aphides or scale enable the fungus to gain an entrance to the living tissues of the plant, as happens in the case of larch canker, apple-tree canker, &c.

The first indication of disease is the wilting and yellowing of the leaves, which fall quite early in the season. As a rule, a branch is not killed outright in the first season of the attack, but during the second year the leaf-buds remain in a half-opened condition and the branch dies, owing to the presence of the fungus *mycelium* in the conducting vessels, which prevents the ascent of water in the branch.

The fungus does not show itself externally until the branch is dead, or nearly so, when its fruiting bodies burst through the bark under the form of large elongated and transversely grouped black warts. These warts are often quite numerous and give a blackened appearance to the branch.

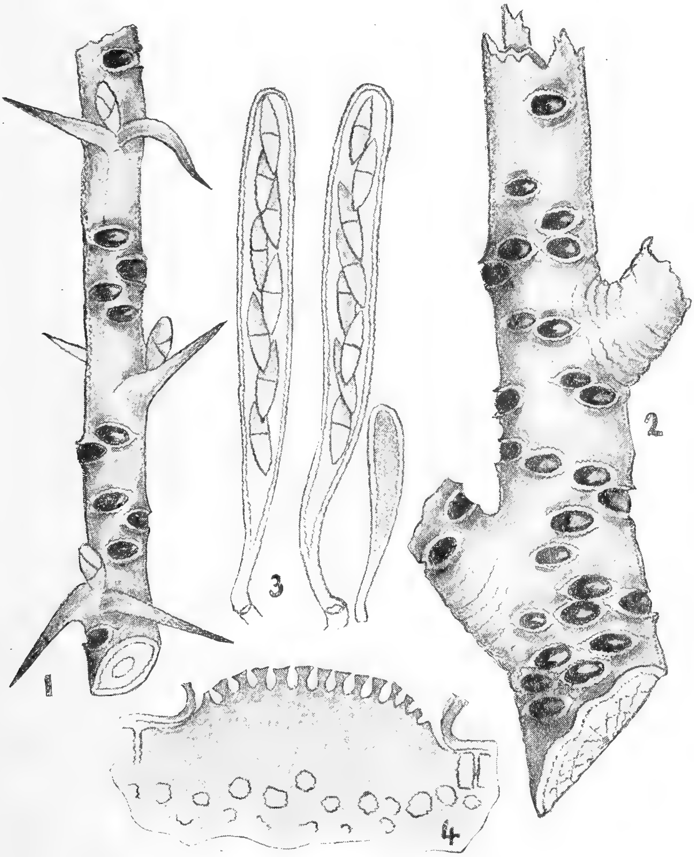


FIG. 1.—Black-knot on gooseberry stem (nat. size).
FIG. 2.—Black-knot on red currant stem (nat. size).
FIG. 3.—Spores of the fungus (highly mag.).
FIG. 4.—Section through a black fruiting pustule of the fungus (slightly mag.).

Treatment.—Spraying is of no avail in the case of this fungus. On the first appearance of disease, indicated by wilting of the foliage, infected branches should be removed and burned. Bushes should be kept clear of aphides and currant scale.

Notes on Insect, Fungus and Other Pests.*

MOTHS.—A specimen of the pupa of the Puss Moth (*Cerura vinula*) was received from Manchester. This moth gives rise to large caterpillars which feed on the leaves of willows and osiers, and may occasionally cause considerable damage. Caterpillars of the Goat Moth (Leaflet No. 60) were reported as doing much damage to pear trees near Newbury. A short note on this moth appeared in the January (1908) *Journal*, p. 620.

BEECH COCCUS.—The Felted Beech Coccus (*Cryptococcus fagi*) has been reported from Longfield (Kent), Chichester, High Wycombe, Northampton, Penn (Bucks), and Gerrard's Cross (Bucks). (See Leaflet No. 140.)

APHIDES.—Specimens of privet received from Derby late in December, were found to have been infested by aphides. The *Aphis* (*Rhopalosiphum*) *ligustri* is known to attack privet in Great Britain, but there is no account of its life history. (Treatment for aphides will be found in Leaflet No. 104.)

Gooseberry bushes received from Topham, Devon, were found to have had the tips of the shoots primarily injured by aphides, thus enabling the fungus *Sclerotinia fructigena* to gain a foothold. It was recommended that the shoots should all be pruned back for 6 in. and the prunings burnt. Gooseberry specimens from Glanton, (Northumberland), were also infested by aphides (see Leaflet No. 68).

RED SPIDER.—Specimens of apple trees from St. Mary Cray, Kent, and from Buxton were found to be covered with the eggs of the Red Spider (see Leaflet No. 41).

WINTER WASHING OF FRUIT TREES.—During the next few weeks winter washing of fruit trees (see Leaflet No. 70) should take place, this process having an excellent effect in cleaning the trees of moss, lichens, and rough bark, thus destroying the winter quarters of many noxious insects.

Winter washing with a caustic wash may also destroy many hibernating insects, together with eggs, which would otherwise later on be the source of much damage to the trees.

A wash composed of the following materials has been found

* Notes on insect, fungus and other pests, dealing with the specimens submitted to the Board for identification, and their apparent prevalence, will appear in this *Journal* month by month. The notes commenced with the issue for June, 1907.

of great value at the Woburn Fruit Farm: 2 gallons paraffin, $1\frac{1}{2}$ lb. soft soap, 6 lb. caustic soda (98 per cent. pure), 28 gallons water. In order to prepare this wash, the soft soap should first be dissolved in 1 gallon of boiling water; to this the paraffin should at once be added (not while over the fire) and the mixture churned with a syringe or force pump until a cream-like emulsion results. The 6 lb. of caustic soda should next be dissolved in the remaining 27 gallons of water and be poured into the emulsion, the whole thoroughly incorporated and the wash used at once. For small quantities for garden use the proportions may be: 5 pints paraffin, $\frac{1}{2}$ lb. soft soap, 2 lb. caustic soda and 10 gallons of water.

Teredo or "Shipworm."—From Felixstowe the Board received for examination specimens of harbour piles of pitch pine, which had broken off within twelve months of their first being driven. The broken portions had the appearance of having been eaten through and through by worms, a section showing quite a honeycombed condition. The piles had not been treated in any way by the use of preservatives.

The examination of the specimens showed that the piles had been attacked by *Teredo*, the so-called Shipworm, a member of the *Mollusca*. The shells of this mollusc enclose a small but vulnerable part of the body; a sucker-like foot can be protruded, and at the end of the shell two syphons project, these being for the purpose of taking in water, which carries in it oxygen for respiration and the small organisms on which the Teredo chiefly feeds.

Life History.—Eggs are produced in immense numbers and remain attached to the Teredo gills. Later, after the hatching of the eggs, a fry or free-swimming young stage is found. These young forms, which are extremely minute, move about amongst the wood piles and later settle down on them to enter between the wood fibres. The Teredo increases in size, and as it grows the burrow in the wood is made larger and is lined by a shell-like sheath. Into this sheath the syphons can be retracted for protection and the end closed by means of two calcareous pallets which are found near the point where the two syphons (united for a great part of their length) diverge. Several points in the life history of the pest are still obscure.

Treatment.—Once the pest has got into the wood remedial

measures are not possible. For prevention it has been suggested that, at the time of breeding, the male fertilising material would be destroyed by adding some poison to the water. Apart from the fact that fertilisation is not limited to a short period, but may continue during summer, there are other difficulties in the way.

In the treatise of Sellius no fewer than 600 ointments or oils are mentioned as having been tried in vain in attempts so to treat the wood as to render it proof against Teredo. For this purpose creosote is sometimes used, but although this material may afford some protection for a short time it cannot be relied on. For example, Jeffreys quotes a case where in Christiania Harbour the piles had been thoroughly creosoted at the rate of 10 lb. to the square foot, and yet in two years, in spite of the saturation with creosote, the piles were riddled by Teredo.

Treating wood piles with water glass (liquid silicate of potash) has been tried, and the use of silicate of lime or other dressings used to protect stonework has been suggested. Exposed piles have had nails driven into them all over, with the heads very close together. The rust or iron crust which results is believed to afford some protection, but if the layer is thin or if it peels away the tiny Teredo fry gain entry through the chinks between the nail heads.

Copper sheathing is protective, and piles have been successfully protected by casing them in wooden boxes, the intervening space being filled in with cement.

The Engineer to the Sydney Harbour Board recently reported on a method of sheathing iron bark timber with yellow metal. Iron bark sheathed with Muntz metal had been in use for fifty years and the timber still remained sound. It was found, however, that the Muntz metal supplied recently had not lasted, and the decay has been ascribed to the electrolytic process by which copper is now produced. It is therefore advised that navy brass should be used with the addition of 1 per cent. of tin.

In the case of a pier where it was found that wooden piles were continually being destroyed by Teredo, wood had ultimately to be done away with, and the pier-props now consist of cement with an iron core.

MICE INJURING TREES.—The Board have been asked to suggest a method for combating mice or voles which are stated to be doing great damage to young elms at Woodstock, the trees being completely ringed by gnawing of the bark round the bases and for a distance of about 4 in. up the stems. The trees were being smeared with "Smearoleum," and this should protect them against the gnawing of the mice.

A further method of preventing injury consists in spreading here and there beside the young trees to be protected a few branches of soft-wooded trees. These are used as food, the voles preferring to bark or nibble what is lying on the ground rather than the trees. These branches should be changed at intervals, for as soon as they are dry the rodents will cease to use them for food but will utilise them for shelter. Should poison be resorted to, such collections of branches would be good position in which to place the bait. In poisoning, the oatmeal or flour mixed with arsenic or other poison should not be left exposed but should be placed in glazed pipes 1½ in. in diameter; the mice then get access to the bait while larger animals cannot reach the poison.

Pitfalls or trenches, as recommended in this *Journal* for June last (p. 182) are very useful traps, and 10,000 mice were caught in autumn in Mecklenburg in a trench between two fields. Drain pipes are sometimes laid in the bottom of the trenches, with the open end level with the bottom of the trench. Grains of wheat may be dropped in as bait.

FUNGI.—Among fungi, a specimen of apple from St. Mary Cray was infested with Coral Spot disease (see Leaflet No. 115); apple twigs from Birmingham and Limpsfield (Surrey), were affected with Brown Rot (see Leaflet No. 86); specimens of apple trees from Limpsfield were attacked by Apple Canker (see Leaflet No. 86); and raspberry canes from Kelvedon, S.O., Essex, were infested with *Fusarium tubercularioides*, Sacc., which has hitherto been considered as a saprophyte growing on canes that had succumbed to other causes. An attempt to inoculate healthy canes has not been attended with success, and if the fungus is in reality a parasite, infection probably occurs during vigorous spring growth of the canes. The fungus becomes evident subsequent to the death of the canes.

The Board of Agriculture have received from Mr. W. E. de Winton, Orielton, Pembroke, the following note (dated 23rd January, 1908) on the habits and food of wood-pigeons :—

Food-habits of Wood Pigeons.*

"Since the 10th December several pigeons have been killed weekly, the contents of their crops examined and notes taken of the fields on which the birds were usually feeding. In this neighbourhood there is no beech mast this year and acorns are very scarce. No large flocks of pigeons are to be seen, and I doubt if any migratory birds have found their way to this part of the country. During the mild and damp weather from the 18th to the 20th of December the pigeons were feeding mainly on the spangle gall found on the fallen oak leaves, and on rape and swede tops. Individual crops would vary from being almost entirely composed of one or other of these substances to a mixture of all three. For instance, among ten birds killed between the 10th and 17th December, there were full crops composed of: (1) Spangle galls, about 20 oats and one acorn; (2) swede tops with a few galls; (3) rape and a few ivy berries and spangle galls.

"When the east wind dried the land and some ploughing was done, the birds drew on to the freshly turned soil in search of the sweet and succulent root of the silver weed (*Potentilla anserina*), with which scourge parts of our fields are much infested. Some seemed to prefer an exclusive diet of this root, while others mixed it with a little rape or swede tops. During the very severe weather at the end of the year, when we had 20 degrees of frost for four consecutive nights, the ploughed land was a favourite feeding ground as the roots of the silver weed protruding from the turned furrows could be readily broken off. This food, broken in short length with frozen earth adhering to it, filled the crops with a soft muddy mass to which was added some ivy leaves and berries. Some birds, however, still held on to the rape. Since the frost, more ploughing has been done and the main food of the wood-pigeons seems to be the roots of silver weed, twitch and mares tail (*Equisetum*), as it is also of the pheasants. I have not seen any pigeons on clover yet."

* The Board would be glad to receive similar notes from other observers on the habits of birds reputed to be beneficial or injurious to agriculture.

The returns of the acreage under crops and the number of live stock form Part I of the volume of *Agricultural Statistics for the Year* 1907.* [Cd. 3870. Price 5*d*.]

Collection of Agricultural Statistics.

The returns are prefaced by a report by Mr. R. H. Rew, in the course of which he observes that the readiness with which for more than forty years the farmers of Great Britain have annually responded to the demands made upon them for statistical information must be cordially recognised. The small minority (amounting in the present year to only 2·4 per cent. of the whole) who decline or neglect to fill up the schedule at the request of the Board may for all practical purposes be ignored, the only result of their action being to introduce a slight element of error in the estimates which have to be made in default of actual returns for their holdings. It appears that the defaulters are most numerous in Scotland and least numerous in Wales, where they amount to only 0·1 per cent. of the total. In England the proportion of estimated returns is only 1·2 per cent. The collection and publication of precise information relating to agriculture is not only of interest to the public at large, but is beneficial to the interests of farmers themselves—if only as a means of correcting erroneous or biassed representations of the agricultural situation, and it is to be hoped that this fact will, in due time, be appreciated by the small number of occupiers who at present withhold their assistance. It must fairly be added that while thanks are primarily due to farmers generally for their willingness to render the returns, the completeness of the statistics and the promptitude with which they are available are largely attributable to the energy and zeal of the Inland Revenue officers upon whom the work of collection falls.

The general desire for fuller information relating to agriculture impels the Board from time to time to extend their demands upon farmers to enable them to supply it. In the past year the principal addition was a requirement of details relating to the cultivation of fruit so as to enable some estimate to be made of the relative importance of the principal sorts of fruit grown in Great Britain.† A division of the cows and

* The figures for the leading crops and for live stock were given in this *Journal* for September, 1907.

† See p. 688.

heifers in milk and in calf, with the view of obtaining a closer approximation of the milking herd of the country, was also made, while another inquiry was directed to an attempt to ascertain the extent to which the holdings included in the returns are occupied by persons who are not primarily engaged in farming as a business.

With the view of facilitating the collection of the returns in Wales, a bi-lingual schedule was issued in those parts of the Principality where Welsh was likely to be more familiar than English to the farmers concerned. From the collectors' reports it appears that on the whole the bi-lingual schedule tended to increase the accuracy of the returns and to facilitate the work of collection.

The principal changes in the area devoted to crops and in the numbers of live stock are discussed in the report and illustrated by diagrams.

Area Devoted to Fruit Cultivation.

The growing importance of fruit cultivation in this country has led to a demand for more detailed statistics of its extent than have hitherto been collected. The returns annually obtained of the total area under small fruit and orchards respectively have afforded a rough measure of the growth of the industry as a whole, and show an increase during the past ten years of 12,000 acres of small fruit and 25,000 acres of orchards.

In the returns up to 1907 a certain unknown proportion of the acreage bearing small fruit was also returned under orchards, and no information was afforded as to the kinds of fruit and their relative importance. An attempt has been made to supply these deficiencies, in some degree at least, while at the same time maintaining the continuity of the statistics. Occupiers were requested to return small fruit under four, and orchards under five, headings, and also to state how much of the land under orchards was also returned as under small fruit. An obvious difficulty arose with reference to land on which more than one kind of fruit was grown, and the following instruction was given in the schedule: "The acreage under *mixed* small fruit, containing more of one sort than another, should be entered against the sort to which the larger proportion of the fruit belongs. Where the sorts are equally

mixed the entry should be made against 'Other Kinds.'" A similar instruction was given with regard to orchards. The acreage returned under each kind of fruit must consequently be regarded as approximate.

The following statement summarises the returns received; the details for counties are given in Part I of the *Agricultural Statistics*, 1907. [Cd. 3870. Price 5*d.*] :—

—	England.	Wales.	Scotland.	Great Britain.
	Acres.	Acres.	Acres.	Acres.
Small fruit—				
Strawberries	23,623	780	3,424	27,827
Raspberries	6,480	20	2,378	8,878
Currants and gooseberries ...	24,179	177	1,234	25,590
Other kinds	19,090	236	554	19,880
Total	73,372	1,213	7,590	82,175
Orchards—				
Apples	168,576	3,115	952	172,643
Pears	8,635	93	183	8,911
Cherries	11,952	40	35	12,027
Plums	14,571	60	270	14,901
Other kinds	40,384	363	947	41,694
Total	244,118	3,671	2,387	250,176
Acreage of small fruit in orchards	22,580	106	806	23,492
Total area under fruit	294,910	4,778	9,171	308,859

As compared with 1906, there is an increase of 1,949 acres under small fruit and of 2,489 acres under orchards. Many of the collectors report that the new classification led to greater accuracy in the returns both of small fruit and orchards, and and it may be assumed with some degree of confidence that the total acreage devoted to fruit-growing on holdings exceeding one acre in Great Britain is fairly represented by the above total of 308,859 acres.

Agricultural Credit Banks in the Colonies.*

An Act has recently been passed in the Cape of Good Hope providing for establishment of a Government bank for the purpose of assisting the occupation and improvement of agricultural lands. The management is vested in a board of trustees appointed by the Governor,

* See also articles on Agricultural Credit Banks, May, 1905, p. 96; Agricultural Credit in France, June, 1905, p. 149; Village Banks in England, June, 1905, p. 154;

and a sum not exceeding £1,000,000 sterling may be advanced to them from funds of the Post Office Savings Banks at not more than 4 per cent. interest.

Advances may be made by the board to farmers for the following purposes :—(a) To pay off existing liabilities in cases in which the board approves of an advance for improvements ; (b) to effect improvements, including (1) water storing and irrigation, (2) fencing, (3) clearing land for cultivation, (4) planting orchards and vineyards, and (5) farm buildings ; and (c) for purchase of stock and plant. No advances are to be made except on the security of a first mortgage on land and the amount is not to exceed two-thirds of the value of the property. No loan will be less than £50 nor more than £3,000. The rate of interest is not to exceed 5 per cent., and repayments are to be made half-yearly as may be agreed.

The *Natal Government Gazette* of 22nd October contains a copy of an Act (No. 27 of 1907) authorising the Government to assist persons engaged in agricultural and pastoral pursuits by loans, and to appoint a Board of Commissioners for the management and administration of a fund created for that purpose. Advances may be made to farmers and landowners (a) to pay off existing liabilities ; (b) to effect improvements, including water pumping, storing, irrigation, fencing, clearing land for cultivation, planting of orchards, &c., and farm buildings ; (c) for purchase of live stock and plant—on security of freehold or quit-rent land, land held from the Crown or land held under private lease if the landlord becomes a joint mortgagor. Loans are not to be granted for less than £50 or more than £1,500. Applications for advances of £500 or under are to have precedence over those for a larger amount.

The Transvaal Government have also passed an Act (No. 26 of 1907) on very similar lines. The funds of the bank to the amount of £2,500,000 sterling are to be advanced from the Transvaal Guaranteed Loan, and a loan to any one person is not to be less than £50 nor more than £2,500, except for large agricultural or irrigation works which may be specially

Agricultural Credit in Hungary, July, 1905, p. 210 ; Agricultural Credit in Belgium, August, 1905, p. 279 ; Agricultural Loans in Queensland, September, 1905, p. 375 ; Agricultural Credit in Germany, March, 1906, p. 725 ; and Agricultural Credit in Denmark, May, 1906, p. 118.

authorised, in which case the advance may be increased to £5,000. The advance is not to exceed three-fifths of the value of the land.

The Agricultural Bank Act of Western Australia (No. 15 of 1906) provides for the issue of mortgage bonds for the purpose of providing funds for advances to farmers. The advances are to be made on the security of land and are to be for the purpose of clearing fencing, draining, or water supply, for paying off previous mortgages, and for the purchase of stock for breeding purposes. Up to £300 the advance may be to the full value of the proposed improvement, and further advances not exceeding £200 may be made to one-half of the value of the improvement ; but for the purpose of paying off previous mortgages the advance is not to exceed three-fourths of the improvements already made on the holding and not more than £100 is to be advanced for the purchase of breeding stock.

Samples under the Fertilisers and Feeding Stuffs Act.

The Board have addressed the following Circular letter, dated 28th January, 1908, to Local Authorities in Great Britain as to the circumstances in which samples taken under the Fertilisers and Feeding Stuffs Act should be forwarded to the Chief Agricultural Analyst :—

SIR,

I am directed by the Board of Agriculture and Fisheries to inform you that on two occasions during the past year, Agricultural Analysts who have concluded from the analysis of one part of a sample submitted to them under the Fertilisers and Feeding Stuffs Act, 1906, that some of the provisions of that Act had been infringed, have forthwith sent the second part to the Offices of the Board.

When this course is adopted, it may be necessary for the Board to instruct one of their officers to deliver the sample personally to the Principal Chemist or his representative at the Government Laboratories, in order that there may be no difficulty in establishing the identity of the second part of the sample. It may also be necessary that the officer should attend the hearing of the case.

The Board would be glad, therefore, if Local Authorities would instruct their Agricultural Analysts to retain the second part of any sample, in respect of which there is a prospect of proceedings, until three months have elapsed from the date when the invoice was received from the purchaser, or until they are requested to forward the second part of the sample to the Principal Chemist. In the latter case, the part of the sample should be so sealed and marked that there may be no difficulty in identifying it, and forwarded by registered parcel post to the Principal Chemist, Government Laboratories, 13, Clement's Inn Passage, Strand, London, W.C.

I am, &c.,

T. H. ELLIOTT,

Secretary.

Notes on the Weather in January.

The weather during January was characterised by an unusual variety of conditions. During the *first* week (ending Saturday the 4th) it was dull at first, with occasional snow showers in the north and locally at several places further south. Later on a decided improvement took place, the amount of bright sunshine recorded over England on the three last days being exceedingly large for the time of year. Temperature was, of course, below the average, being "deficient" or "very deficient" throughout the United Kingdom. Rainfall was "very light" everywhere except in Scotland E., where it was "light," while except in Scotland and England N.E. it was "abundant" or "very abundant." During the *second* week the conditions were mostly reversed. The warmth continued to be "deficient" everywhere except in Scotland E., but rainfall, with the single exception of England N.W., was "heavy." Sunshine was generally "moderate," but "abundant" in England N.E., N.W., S. and S.W. At Heathfield in Sussex, the amount of rain for the 24 hours ended 9 a.m. on Wednesday morning was 2·06 in., and the depth of snow still lying was 8 in. During the *third* week an entirely different set of conditions prevailed. Temperature, after being very low in most parts of Great Britain, rose suddenly to a high figure for the time of year, and finally fell again to about the normal. The rainfall in the eastern section of the Kingdom was, as a rule, "light" or "very light"; in the western section "heavy," except in England S.W. Bright sunshine was above the average, the excess being large in some places. During the *fourth* week, over a large portion of Great Britain, the weather was dry and occasionally very bright, but a considerable part of the time was either misty or foggy, especially in the centre, south-east and east of England. Warmth was "deficient" throughout England, the maximum during the middle of the week throughout the central counties of England not being much above freezing point. Rainfall was "very light" nearly everywhere, but on more than one occasion a measurable quantity of water was yielded by the wet fog or mist. Bright sunshine varied greatly in the different districts.

With such a variety of changes taking place it is not surprising that no phenological observations were transmitted to the Board.

Notes on Crop Prospects Abroad.

World's Wheat Crop.—The Hungarian Minister of Agriculture has issued his final estimate of the world's wheat crop of 1907, in which he puts the yield at 849,070,000 metric quintals (390,040,000 qrs. of 480 lb.), as compared with 925,410,000 quintals (425,110,000 qrs.) in 1906. A revised estimate of the crop, which is given in *Beerbohm's Corn Trade List* (24th January), amounts to 394,275,000 qrs., as against 441,080,000 qrs. in 1906, while in *Dornbusch's List* (31st January) it is estimated at 395,150,000 qrs. (by measure) as against 432,880,000 qrs. in 1906. (See *Journal*, September, 1907, p. 373.)

India.—The first General Memorandum on the Indian wheat crop (*Indian Trade Journal*, 26th December, 1907) of the season 1907–08 states that the season has been extremely unfavourable owing to the untimely cessation of the rains. This had the effect of restricting and delaying sowings, so that it has been difficult to obtain returns of acreage, and also induced the substitution of food grains for local consumption. As a result, the total area under wheat in British territory is now returned at 15,477,600 acres, as compared with 23,583,600 acres in 1906–07. This marks a contraction of 8,106,000 acres, or 34·4 per cent.; but it will be noted that, as regards the United Provinces, which usually bear some 27 per cent. of the total wheat crop, there is some reason to hope that the estimate may prove to be too low. The Native States in Bombay are alone in reporting an increase, but the Sind Native States show a decline of some 12,000 acres.

Altogether the tracts from which estimates of area have not been received usually represent some 15 per cent. of the entire wheat acreage.

From all sides it is reported that, as regards the rate of yield from the area sown, everything depends on the timely arrival of sufficient winter rains.

Russia.—Mr. Consul Woodhouse, writing on 30th December, observes, with regard to the autumn sowings, that the winter rye is stated to be in an unsatisfactory condition, the wheat poor, and the area sown less than usual. The same unfavourable climatic conditions prevailing at the close of the past harvest season, which proved so detrimental to the crops in the south-western provinces, continued unaltered throughout the sowing period. The unusually intense and prolonged drought that set in towards the end of July was severely felt in the black soil zone that extends from the western frontier to the Volga. Even in the south, night frosts occurred early in September. Although a little rain did fall towards the middle of September, the weather became milder for a very short time only, and the sudden changes in the temperature that continually occurred acted detrimentally on the sowings, which in some cases had already sprouted. On the other hand, over nearly all the northern lands the autumn was remarkable for the prevalence of mild, warm weather, accompanied by abundant showers. The winter set in towards the beginning of November. In the north, the frosts were preceded by a timely fall of snow that acted as a mantle to the winter corn, already germinated and progressing favourably. The importance of this covering of snow cannot be over-estimated. In the south, where many districts were visited by unseasonably early and intense cold, without any fall of snow, the outlook is again poor.

On the whole, therefore, the result of the abnormal meteorological conditions is a marked contrast in the state of the winter sowings in the southern loam belt and in the less fertile northern fields; the latter, and less important as regards area, productiveness and population, being at least at this stage more advanced and favoured than the former.

A despatch from Mr. Consul Medhurst, dated 15th January, states that the latest official reports from the Don Cossack district show that the winter sowings have suffered severely from the dry autumn and severe early frosts. From the Kuban districts in the North Caucasus, similar unfavourable reports have likewise been received, and it is feared that the greater part of the important grain area in the North Caucasus has suffered from the same causes, and that the amount of grain available for export from these districts in 1908 will be lessened.

Germany.—The Imperial Statistical Bureau give the yield of winter wheat in 1907 as 2,613,826 tons (of 2,204 lb.) as against 3,570,807 tons in 1906. Part of the deficiency was made up by a larger crop of spring wheat which is returned at 865,498 tons as compared with 368,756 tons last year. The yield of potatoes was 45,538,299 tons, about 7,400,000 tons less than last year, but the proportion diseased is stated to be 6·4 per cent.

Miscellaneous Notes.

Inspection of Ordnance Survey Maps.—Copies of Ordnance Maps on the 6-inch and smaller scales, containing the latest information, are available for public inspection, without charge, at the Office of the Board of Agriculture and Fisheries, 3, St. James's Square, London, S.W. Copies of the latest published editions of the Ordnance Maps on the 25-inch scale are also available for inspection, provided that four clear days' notice is given, stating the sheets required, and a fee of 6*d.* is paid.

The Ordnance Survey Maps are copyright, and no information contained therein may be published without permission, nor are tracings or extracts allowed to be made by persons inspecting them. Copies of Ordnance Maps containing the latest corrections of the boundaries of administrative areas may be obtained from the Board on application, the price of the map and the cost of preparation being charged to the purchaser.

Importation of Horses into Great Britain, Ireland, the Channel Islands and the Isle of Man.—Under an Order of the Board of Agriculture and Fisheries, entitled the Glanders or Farcy Order of 1907, which came into force on the 1st January, 1908, no horse, ass or mule brought to Great Britain from any other country, except Ireland, the Channel Islands or the Isle of Man, is to be landed in Great Britain unless it is accompanied by a certificate of a veterinary surgeon to the effect that he examined the animal immediately before it was embarked or whilst it was on board the vessel, as the case may be, and that he found that the animal did not show symptoms of glanders or farcy.

As regards importation into Ireland or the Channel Islands, intending exporters of animals from Great Britain should communicate in the first instance with (1) the Secretary, Department of Agriculture and Technical Instruction for Ireland, Upper Merrion Street, Dublin; (2) the Piers and Harbours Committee of the States of Jersey, Greffe Office, Royal Square, St. Heliers, Jersey; or (3) the Supervisor, Guernsey, as the case may be, with a view to ascertain the steps to be taken to comply with the regulations of the Government concerned.

Visitors to Kew Gardens during 1907.—The number of persons who visited the Royal Botanic Gardens, Kew, during the year 1907 was 2,962,714. These figures represent an increase of 623,222 visitors over the year 1906, when the numbers were 2,339,492 which up to that time was the largest number recorded. The total number on Sundays was 1,268,501, and on week-days 1,694,213. The corresponding numbers for 1906 were 867,148 and 1,472,344 respectively.

The increased popularity of Kew Gardens during recent years is shown by the steady annual growth in the number of visitors. The average for the ten years 1893–1902 was 1,352,425, whereas in 1907 that number was more than doubled. The average for the five years 1903–7 was 2,011,748.

Year.	Sundays.	Week-days.	Total.
1903	568,726	783,822	1,352,548
1904	675,225	904,441	1,579,666
1905	853,631	970,688	1,824,319
1906	867,148	1,472,344	2,339,492
1907	1,268,501	1,694,213	2,962,714

Sales of Glebe Lands.—A Return has been prepared by the Board of Agriculture and Fisheries showing for each county the sales of glebe land effected under the Glebe Lands Act, 1888, giving in each case the benefice or parish, the situation of the land sold, the acreage, the purchase money, and the number of purchasers. [H.C. 335. Price 3*d.*] The total extent of glebe land sold under the Act is 26,273 acres, and the total amount realised was £1,399,880. In addition, a further sum of £7,675 was paid for other property sold.

School of Forestry in the Forest of Dean.—The School of Forestry, which has been established by the Commissioner of Woods and Forests in the Forest of Dean, is reported to have made satisfactory progress. There are now 14 men at the school, of whom six came from private estates and eight were crown labourers in Dean Forest. Up to the present 13 men have passed through the school, and of these three have obtained situations as assistant woodmen in the Royal Forests, one as assistant pole inspector in the Post Office, and two as head woodmen on private estates. Sir E. Stafford Howard, in his Report for 1906-7, observes that there appears to be a satisfactory demand for the education given, though the school is still unknown in many parts of the country. The applications received for trained men show that there is a demand for the services of qualified woodmen.

Manufacture of Nitrate of Lime in Norway.—The method of manufacturing nitrate of lime by the Birkeland-Eyde process has been briefly described in this

Journal (January, 1906, Vol. xii, p. 598). The first factory was opened at Notodden, in Sweden, in 1905, and contained three furnaces, each of 700 horse-power. According to a despatch from Mr. F. E. Drummond Hay, Consul at Christiana, further works are now under construction, which will have an equipment of 32 large electric furnaces, each of 1,000 horse-power. The output from these works is expected to be 20,000 tons a year. The power station at the Svälgfos waterfall, near Notodden, is said to be the largest of its kind in Europe, being able to develop 40,000 horse-power, and has four turbines of 10,000 horse-power each, each driving its own generator.

Use of Kainit against American Gooseberry Mildew Spores.—A suggestion has been made to the Board that kainit might be used to destroy the spores of the American Gooseberry Mildew in the soil. Kainit is a well-known fungicide and is used especially against fungi spreading in the soil. This substance will not destroy the intact winter spores, but it will kill the germ-tubes when the spores germinate in the spring.

Four cwts. per acre is sufficient, except on very loose or sandy soil where 6 cwts. might be applied. The kainit should be crushed, dredged on the land and pricked in very lightly. This work should be completed not later than the end of February; in fact, it should be done before the gooseberry leaf buds begin to expand.

Reclamation of Mud Flats.—A note appeared in this *Journal*, July, 1907 (p. 247), as to the value of the *Spartina* grasses for the protection of muddy foreshores. In the *Gardeners' Chronicle* for 18th January, 1908, Dr. Otto Stapf, of Kew Gardens, gives some particulars, illustrated by maps, of the rapid extension in recent years of the variety *Spartina Townsendii* on the coast of Sussex, Hampshire, and the Isle of Wight. It is suggested that this variety is a hybrid between *S. stricta* and *S. alterniflora*, and it appears to be wonderfully adapted to life on mud flats. The immediate effect of the appearance of this grass on the mud flats of the south coast has been to relieve their bareness and even to beautify them to some extent, and it has, no doubt, already affected animal life. Physical changes must follow, which, if the grass continues to flourish and spread, will react on the general conditions of the foreshore, resulting probably in the solidification and raising of the mud banks; but this process will take time, and it is at present barely beyond the first stage.

Tanning Industry in the United States.—Although the tanning industry is widely distributed over the United States, the greater part of it is carried on in the States of Pennsylvania, New York, Michigan, and Wisconsin. The consumption of tanbark in 1906 by 617 tanneries was 1,371,342 cords, valued at 12,774,071 dols. The principal kinds of bark used were hemlock and oak, and of the total amount about two-thirds was hemlock, whilst almost all the rest was oak, the quantity of chestnut and unclassified barks being relatively unimportant. In addition, 658,777 barrels of extract, valued at 8,713,322 dols., were consumed. Of the extract manufactured from domestic woods and barks, chestnut extract formed the largest amount, being double the combined quantities of that from oak and hemlock. Quebracho extract, which is imported, constituted by far the largest amount of any one kind.

The use of tanning extract is rapidly growing. In 1900 the amount was 64,043 barrels; by 1906 its consumption had increased until the total value was over two-thirds of the value of the tanbark used. Extracts of four kinds are distinguished—oak, hemlock, quebracho and palmetto. All are products of the forest, but palmetto is obtained from the roots rather than from the bark or wood of a tree. An extract made from both the bark and wood of the chestnut tree is coming into general use, and over 257,000 barrels of this were consumed in 1906. (*Board of Trade Journal*, 16th January, 1908.)

Laburnum Poisoning.—A case has recently been brought to the notice of the Board in which two horses were alleged to have been poisoned in North Wales by eating laburnum seeds, which were found in their stomachs on post-mortem examination, although the quantity of seeds found was very small. Other horses had been kept in the same field for many years past without anything of the kind occurring before. In this connection it may be stated that the leaves, pods, and seeds of the

laburnum tree, *Cytisus Laburnum*, are poisonous, the seeds being especially so. Cases of such poisoning, however, are probably not of such frequent occurrence in cattle as in children. The symptoms attendant on laburnum poisoning in cattle are trembling, disinclination to move, partial paralysis of the limbs, tympany, and salivation.

Two Cruciferous Weeds.—During September the Board received from Wolverhampton specimens of two cruciferous weeds resembling white Charlock (*Raphanus raphanistrum* L.). They were identified as *Raphanus microcarpus*, Willk., and *R. sativus*, L., var. *oleifer*, DC. The former is not very common in this country, while the latter is a rare casual. As they were growing freely amongst corn, the weeds were sprayed early with strong, pure copper sulphate solution, which, however, had no effect on them whatever. They are not likely to prove very troublesome, but where they come up thickly the hoe should be freely used in a root crop, while in corn crops they should be hoed, or "topped" with a scythe when the plants are flowering. Some plants are very bulky, consisting of as many as twenty stems, while they are from 2 ft. to 3 ft. high. The introduction of a potato crop into the rotation two or three years after a root crop often clears land of Charlock, and this plan might be tried with the species under consideration. Seeding should be prevented, even if hand-pulling must be resorted to, while any grain sown should be entirely free from the seeds.

The Fruit Fly.—The *Kew Bulletin* (No. 1, 1908) contains an account of this insect (*Ceratitis capitata*) in the course of which reference is made to the discovery in Western Australia of the value of pure kerosene as means of destroying these flies. The kerosene is placed in shallow vessels in the orchard and appears to attract the insects; in one instance no less than 1,268 flies were destroyed in this way in 24 hours. Since the oil only kills the adult flies, it would still be necessary to collect and destroy fallen infected fruit, so as to kill the maggots, but it is thought that by these two methods of attack the fruit-fly pest may be kept in check.

Supply of Phosphates.—The imports of phosphate of lime and rock phosphate in 1907 exceeded for the first time half-a-million tons, whereas the average receipts in the preceding five years were 408,000 tons, while in the five years 1897–1901 they were only 357,000 tons. The average value seems to have also slightly increased from 30*s.* per ton in 1897 to 32*s.* 6*d.* in 1907. The exports of superphosphate cannot be stated as they are not separately distinguished in the Trade Returns.

The principal sources of supply are the United States, Tunis, Algeria, France and Belgium. A writer in the *Journal d'Agriculture pratique* (17th October, 1907) estimates the total production of phosphate in the world as follow :—

	Tons of 2,204 lb.
Florida, Tennessee and Carolina	2,000,000
Algeria and Tunis	1,000,000
Christmas Island, &c.	250,000
France, Belgium, &c.	750,000
	4,000,000

Mr. Consul-General Berkeley in his report to the Foreign Office on Tunis (Annual Series, No. 3883), gives the estimated production in 1906 at 4,500,000 tons, as compared with 3,300,000 tons in 1903, and 2,600,000 tons in 1896. In the conversion of this raw mineral phosphate into superphosphates the weight is increased by some 85 per cent., so that the gross production of the latter fertiliser would seem to amount to over 7,000,000 tons.

SELECTED CONTENTS OF PERIODICALS.

Journal of Agricultural Science. II. 3.

Some air temperature readings at several stations on sloping ground, *R. S. Vinson* and *E. J. Russell*; Some observations on "swollen head" in turkeys, *G. S. Graham-Smith*; The flocculation of turbid liquids by salts, *A. D. Hall* and *C. G. T. Morison*; The effect of fungicides upon the assimilation of carbon dioxide by green leaves, *A. Amos*; The chemistry of strength of wheat flour, *T. B. Wood*; Note on immune wheats, *A.* and *G. L. C. Howard*; Mendelian heredity in cotton, *F. Fletcher*; The botanical and chemical composition of the herbage of pastures and meadows, *S. F. Armstrong*; Oxidation in soils, and its relation to productiveness, *F. V. Darbishire* and *E. J. Russell*; Notes on the hop mildew, *E. S. Salmon.*

Science Progress. II. 7.

Mendelism, *A. D. Darbishire.*

Transactions of the Royal Scottish Aboricultural Society.

Heredity and Forestry, *Wm. Somerville*; The Mountain Pine, *Sir John Stirling-Maxwell*; Soil: its Origin and Nature, *J. Geikie*; The Inverliever State Forest, *R. C. Munro Ferguson*; State Afforestation in Scotland, *F. Bailey*; The Douglas Fir as a Commercial Timber-Tree, *J. D. Crozier*; The Cultivation of Osiers, *R. Sinclair.*

Journal of the Royal Statistical Society. LXX. Part 4. December 1907.

An Inquiry into the Rent of Agricultural Land in England and Wales during the Nineteenth Century, *Robert J. Thompson*; The Assize of Bread at Oxford, 1794–1820, *Adolphus Ballard.*

Annales de la Science Agronomique. 3 Série. II.

2e Fascicule. L'Acide Nitrique et l'Agriculture, *L. Grandeau*; Recherches sur la Nitrification Intensive et l'Etablissement des Nitrières à Hauts Rendements, *MM. Muntz* and *Lainé.*

3e Fascicule. Méthode Chimique pour déterminer la Réserve dite Assimilable de l'Acide Phosphorique dans Terre Arable, *A. de Sigmond.*

Annales de l'Institut National Agronomique. 2 Série. VI. 2.

Utilisation des Insects auxiliares entomophages dans la Lutte contre les Insectes nuisibles à l'Agriculture, *P. Marchal.*

Mitteilungen des Deutschen Landwirtschafts Gesellschafts. 23.

Stück I. Das violette *Solanum Commersonii, L. Wittmack.*

Stück II. Der Stand der Züchtervereinigung im Jahre 1907.

Die Landwirtschaftlichen Versuchs-Stationen. LXVII. 5 and 6.

Über den Wert des spezifischen Gewichtes der Trockensubstanz der Milch bei Feststellung von Milchfälschungen, *K. Teichert.*

Landwirtschaftliche Jahrbücher. XXXVI. 5 and 6.

Vergleichende Untersuchungen über die Ergebnisse von chemischen Bodenanalysen und Vegetationsversuchen, *K. Opitz*; Ein staatliches Besiedelungswerk im Kehdinger Moor, *H. Lange.*

Mitteilungen des Schweizerischen Centralanstalt für das forstliche Versuchswesen. IX.

Ertragstafeln für die Fichte und Buche der Schweiz, *Ph. Flury.*

Yearbook of the Khedivial Agricultural Society, 1906.

The Wheat Problem in Egypt, *W. L. Balls*; Stromeyer's Method of determining the rate of Flow of Water, *F. Hughes*; The Improvement of Egyptian Cattle, *T. P. Goodchild*; Bersin (*Trifolium Alexandrinum*), *J. S. J. McCall.*

Canadian Forestry Journal. September, 1907.

Forest Nurseries and Nursery Methods in Europe, *W. E. Fox.*

ADDITIONS TO THE LIBRARY.

[NOTE.—The receipt of *annual* publications of foreign agricultural and other departments, experiment stations and societies is not noted in the monthly list of additions to the Library, but a list of all such publications, which are regularly received, will be given from time to time.]

Great Britain—

Bunyard, G. Fruit Farming for Profit. 5th Edition. Maidstone: W. S. Vivish & Co. 2s. 6d. net.

Sturges, T. W.—Poultry Culture for Profit. (134 pp.) London: MacDonald & Evans, 1907. 1s. net.

Clapham, J. H.—The Woollen and Worsted Industries. (307 pp.) London: Methuen, 1907.

Smith, F.—Manual of Veterinary Physiology. (715 pp.) London: Baillière, Tindall and Cox, 1907. 15s. net.

Sinclair. J.—History of Shorthorn Cattle. (895 pp.) London: Vinton & Co., 1907.

Whitaker, J.—Notes on the Birds of Nottinghamshire. (298 pp.) Nottingham: Walter Black, 1907.

Forrest, H. E.—The Fauna of North Wales. (537 pp.) Witherby & Co., 1907.

Barron, A. F.—Vines and Vine Culture. 4th Edition. (202 pp.) London: "Journal of Horticulture" Office, 1900. 5s. net.

Publications of the Ray Society:—

Douglas, J. W. and Scott, J.—The British Hemiptera. (627 pp. + 21 plates). 1865.

Cameron, P.—Monograph of the British Phytophagous Hymenoptera. 4 Vols. (340 pp. + 21 plates; 233 pp. + 27 plates; 274 pp. + 17 plates; 237 pp. + 19 plates). 1882–92.

Buckton, G. B.—Monograph of the British Aphides. 4 Vols. (193 + 175 + 142 + 228 pp., and 134 plates). 1875–82.

Buckler, W.—The Larvæ of the British Butterflies and Moths. 9 Vols. Vol. I.—The Butterflies. (201 pp. + 17 plates). Vol. II.—The Sphinges and part of the Bombyces. (172 pp. + 18 plates). Vol. III.—The concluding portion of the Bombyces. (79 pp. + 17 plates). Vols. IV to VI.—The Noctuæ. (115 + 90 + 140 pp., and 52 plates). Vols. VII and VIII.—The Geometræ. (176 + 120 pp., and 42 plates). Vol. IX.—The Pyrales. (419 pp. + 17 plates). 1885–99.

Saunders, Ed.—Wild Bees, Wasps and Ants. (144 pp.) London: Routledge. 3s. 6d.

Walker-Tisdale, C. W. and Robinson, T. R.—The Practice of Soft Cheesemaking. (87 pp.) London: J. North, 1908. 1s. net.

Turner, E. L. and Bahr, P. H.—The Home-life of some Marsh-birds. (62 pp. + 32 plates). London: Witherby & Co., 1907. 2s. 6d. net.

Groom, P.—Trees and their Life History. (407 pp.) London: Cassell, 1907. 25s. net.

Card, F. W.—Farm Management. (270 pp.) London: Constable, 1907. 8s. 6d. net.

Henslow, Prof. G.—Poisonous Plants in Field and Garden. (189 pp.) London: S.P.C.K., 1901. 2s. 6d.

Scharff, R. F.—European Animals. (258 pp.) London: Constable, 1907.

Fletcher-Berry, R. M.—Fruit Recipes. (341 pp.) London: Constable, 1907.

Board of Trade.—Report upon the Conditions and Prospects of British Trade in Canada. [Cd. 3868.] (117 pp.) 1s. 5d.; In New Zealand. [Cd. 3867.] (69 pp.) 8d. London: Wyman, 1908.

[Books may be borrowed from the Board's Library on certain conditions, which may be ascertained on application.]

PRICES OF AGRICULTURAL PRODUCE.

AVERAGE PRICES of LIVE STOCK in ENGLAND and SCOTLAND in the Month of January, 1908.

(*Compiled from Reports received from the Board's Market Reporters.*)

Description.	England. First Quality.	England. Second Quality.	Scotland. First Quality.	Scotland. Second Quality.
FAT STOCK :—	per stone.*	per stone.*	per cwt.†	per cwt.†
Cattle :—	s. d.	s. d.	s. d.	s. d.
Polled Scots	8 1	7 9	38 5	35 2
Herefords	7 10	7 3	—	—
Shorthorns	7 9	7 2	37 2	34 2
Devons	8 1	7 4	—	—
	per lb.*	per lb.*	per lb.*	per lb.*
	d.	d.	d.	d.
Veal Calves	8¼	7¼	9	6¾
Sheep :—				
Downs	9	8¼	—	—
Longwools	8½	7¾	—	—
Cheviots	9¼	8½	9	7¾
Blackfaced	9	8	8½	7¼
Cross-breds	9	8¼	9¼	8¼
	per stone.*	per stone.*	per stone.*	per stone.*
Pigs :—	s. d.	s. d.	s. d.	s. d.
Bacon Pigs	6 4	5 11	6 1	5 5
Porkers	6 9	6 4	6 6	5 10
LEAN STOCK :—	per head.	per head.	per head.	per head.
Milking Cows :—	£ s.	£ s.	£ s.	£ s.
Shorthorns—In Milk	21 12	18 12	21 17	17 18
,, —Calvers	21 14	18 17	19 2	17 7
Other Breeds—In Milk ..	18 15	14 13	19 4	16 2
,, —Calvers ...	11 10	11 5	19 11	15 16
Calves for Rearing	2 2	1 13	2 9	1 10
Store Cattle :—				
Shorthorns—Yearlings ...	9 13	8 11	9 14	8 2
,, —Two-year-olds ...	14 5	12 10	15 5	12 17
,, —Three-year-olds	15 17	14 9	16 6	14 6
Polled Scots—Two-year-olds	—	—	15 0	12 18
Herefords— ,,	14 5	13 2	—	—
Devons— ,,	14 7	12 2	—	—
Store Sheep :—	s. d.	s. d.	s. d.	s. d.
Hoggs, Hoggets, Tegs, and Lambs—				
Downs or Longwools ...	45 0	39 6	—	—
Scotch Cross-breds... ...	—	—	32 0	27 9
Store Pigs :—				
Under 4 months	23 0	16 6	18 11	14 9

* Estimated carcase weight.

† Live weight.

AVERAGE PRICES of DEAD MEAT at certain MARKETS in ENGLAND and SCOTLAND in the Month of January, 1908.

(Compiled from Reports received from the Board's Market Reporters.)

Description.	Quality.	London.	Birmingham.	Manchester.	Liverpool.	Glasgow.	Edinburgh.
		per cwt. s. d.	per cwt. s. d.	per cwt. s. d.	per cwt. s. d.	per cwt. s. d.	per cwt. s. d.
BEEF :—							
English	1st	52 6	51 6	52 6	51 6	59 0*	55 6*
	2nd	51 0	46 6	48 6	48 0	54 6*	49 6*
Cow and Bull ...	1st	38 6	45 0	44 6	42 0	46 0	44 0
	2nd	33 6	41 0	39 0	37 6	40 0	38 6
U.S.A. and Canadian :—							
Port Killed ...	1st	53 6	51 0	50 0	51 6	53 6	52 6
	2nd	49 0	44 6	46 0	47 6	51 6	—
Argentine Frozen—							
Hind Quarters ...	1st	30 6	31 0	30 6	30 6	32 0	33 6
Fore ,, ...	1st	25 6	27 6	26 0	25 6	28 0	29 0
Argentine Chilled—							
Hind Quarters ...	1st	39 6	39 0	38 6	37 6	38 6	40 6
Fore ,, ...	1st	30 6	31 0	28 6	28 0	30 6	30 0
American Chilled—							
Hind Quarters ...	1st	54 0	54 0	53 6	53 0	54 6	55 6
Fore ,, ...	1st	36 6	37 0	35 0	35 0	38 0	37 0
VEAL :—							
British	1st	70 0	66 6	72 6	76 6	—	—
	2nd	66 6	53 0	67 0	72 0	—	—
Foreign	1st	73 6	—	60 6	—	—	63 6
MUTTON :—							
Scotch	1st	73 6	73 0	79 0	77 0	76 0	69 0
	2nd	66 6	57 0	74 6	72 0	66 6	58 6
English	1st	68 6	72 6	75 0	70 6	—	—
	2nd	62 6	57 6	69 6	65 6	—	—
U.S.A. and Canadian—							
Port killed ...	1st	—	70 0	70 0	70 0	—	—
Argentine Frozen ...	1st	30 6	30 6	30 6	30 6	28 6	31 6
Australian ,, ...	1st	28 0	29 0	28 0	28 6	30 6	—
New Zealand ,, ...	1st	38 6	37 6	—	—	—	—
LAMB :—							
British	1st	112 0	—	—	—	—	—
	2nd	102 8	—	—	—	—	—
New Zealand ..	1st	52 6	51 6	51 6	—	—	—
Australian	1st	46 6	47 0	43 0	44 0	44 6	48 0
Argentine	1st	42 0	44 0	45 0	42 6	—	—
PORK :—							
British	1st	57 0	61 0	64 0	62 6	56 0	53 0
	2nd	50 0	54 0	59 0	59 0	53 0	44 6
Foreign	1st	54 0	60 0	59 6	59 6	—	—

* Scotch.

AVERAGE PRICES of **British Corn** per Quarter of 8 Imperial Bushels, computed from the Returns received under the Corn Returns Act, 1882, in each Week in 1906, 1907 and 1908.

Weeks ended (*in* 1908).	Wheat.			Barley.			Oats.		
	1906.	1907.	1908.	1906.	1907.	1908.	1906.	1907.	1908.
	s. d.	*s. d.*	*s. d.*	*s. d.*	*s. d.*	*s. d.*	*s. d.*	*s. d.*	*s. d.*
Jan. 4 ...	28 4	26 0	35 1	24 6	23 11	26 9	18 2	17 3	18 4
,, 11 ...	28 6	26 1	35 2	24 8	24 2	26 9	18 4	17 4	18 3
,, 18 ...	28 5	26 1	35 5	24 11	24 1	27 1	18 4	17 5	18 5
,, 25 ...	28 7	26 2	35 6	25 1	24 5	26 11	18 7	17 5	18 5
Feb. 1 ...	28 10	26 3	35 0	25 1	24 4	26 11	18 10	17 5	18 4
,, 8 ...	28 10	26 6	34 3	25 3	24 5	26 9	18 10	17 7	18 3
,, 15 ...	28 11	26 7		25 6	24 1		19 0	17 7	
,, 22 ...	28 10	26 10		25 4	24 2		19 0	17 9	
,, 29 ...	28 8	26 9		25 0	24 2		19 0	17 9	
Mar. 7 ...	28 5	26 8		25 1	23 11		18 8	17 11	
,, 14 ...	28 5	26 10		24 8	24 2		18 10	18 0	
,, 21 ...	28 4	26 10		24 4	24 0		18 8	18 1	
,, 28 ...	28 3	26 8		24 5	23 9		18 11	18 2	
Apl. 4 ...	28 7	26 9		24 2	24 3		18 11	18 3	
,, 11 ...	28 11	26 8		24 4	23 9		19 4	18 6	
,, 18 ...	29 4	26 8		24 0	23 3		19 1	18 7	
,, 25 ...	29 6	26 10		24 0	23 3		19 6	18 9	
May 2 ...	29 10	27 0		23 10	23 6		19 9	19 3	
,, 9 ...	30 1	27 6		24 1	24 0		20 0	19 7	
,, 16 ...	30 3	28 4		23 10	23 10		20 1	20 1	
,, 23 ...	30 4	29 7		24 2	24 3		20 2	20 5	
,, 30 ...	30 4	31 4		22 10	24 0		20 5	20 8	
June 6 ...	30 3	32 0		23 4	24 7		19 11	20 7	
,, 13 ...	30 4	31 10		23 6	24 7		20 2	20 11	
,, 20 ...	30 5	31 4		22 10	24 11		20 2	20 9	
,, 27 ...	30 3	31 2		24 3	24 6		20 1	20 8	
July 4 ...	30 2	31 3		23 0	24 8		20 2	20 11	
,, 11 ...	30 5	32 0		23 8	24 10		20 4	20 11	
,, 18 ...	30 3	32 6		23 2	24 6		20 5	21 1	
,, 25 ...	30 5	32 11		22 4	27 3		20 2	20 8	
Aug. 1 ...	30 9	33 2		22 1	26 4		19 3	21 2	
,, 8 ...	30 5	33 5		23 0	26 6		17 11	21 3	
,, 15 ...	29 0	33 6		24 2	25 9		17 0	20 4	
,, 22 ...	27 9	33 7		25 0	25 0		16 10	19 8	
,, 29 ...	26 9	33 10		24 3	24 6		16 6	18 11	
Sept. 5 ...	26 4	31 11		24 9	24 2		16 3	17 7	
,, 12 ...	25 11	31 4		24 3	24 4		16 1	17 6	
,, 19 ...	25 9	31 5		24 3	25 0		16 0	17 6	
,, 26 ...	25 9	31 8		24 8	25 3		16 2	17 8	
Oct. 3 ...	26 1	32 6		25 0	25 5		16 3	17 9	
,, 10 ...	26 3	33 3		25 3	25 9		16 7	17 11	
,, 17 ...	26 6	34 4		24 10	26 3		16 8	18 0	
,, 24 ...	26 7	35 9		24 10	27 2		16 10	18 7	
,, 31 ...	26 7	36 3		24 8	27 7		16 11	18 10	
Nov. 7 ...	26 6	35 10		24 8	27 8		17 1	18 10	
,, 14 ...	26 4	35 1		24 4	27 8		17 2	18 8	
,, 21 ...	26 3	34 7		24 1	27 5		17 3	18 9	
,, 28 ...	26 1	34 7		24 1	27 5		17 2	18 7	
Dec. 5 ...	26 1	34 7		24 1	27 1		17 4	18 6	
,, 12 ...	26 1	34 8		23 11	27 0		17 3	18 5	
,, 19 ...	26 3	34 9		24 3	27 1		17 3	18 3	
,, 26 ...	26 0	34 6		24 1	26 10		17 3	18 0	

NOTE.—Returns of purchases by weight or weighed measure are converted to Imperial Bushels at the following rates: Wheat, 60 lbs.; Barley, 50 lbs.; Oats, 39 lbs. per Imperial Bushel.

AVERAGE PRICES of **Wheat, Barley,** and **Oats** per Imperial Quarter in FRANCE, BELGIUM, and GERMANY, and at PARIS, BERLIN, and BRESLAU.

—		Wheat.		Barley.		Oats.	
		1907.	1908.	1907.	1908.	1907.	1908.
		s. d.	*s. d.*	*s. d.*	*s. d.*	*s. d.*	*s. d.*
France:	January ...	39 7	39 5	26 5	26 0	22 11	18 2
Paris:	January ...	40 4	39 0	26 7	26 2	23 2	19 4
Germany:	January ...	38 2	46 6	28 7	30 3	22 10	23 3
		1906.	1907.	1906.	1907.	1906.	1907.
Belgium:	November	28 4	35 2	24 9	27 0	18 9	21 6
	December	29 8	34 5	24 1	26 11	20 9	21 6
Berlin:	November	38 11	48 5	—	—	22 9	24 7
	December	39 7	46 9	—	—	23 3	23 9
Breslau:	November	37 11	47 4	29 3 (brewing) 23 3 (other)	32 6 (brewing) 27 5 (other)	21 0	22 2
	December	37 10	45 6	29 7 (brewing) 23 3 (other)	31 7 (brewing) 27 9 (other)	21 0	21 6

NOTE.—The prices of grain in France have been compiled from the official weekly averages published in the *Journal d'Agriculture Pratique*; the Belgian quotations are the official monthly averages published in the *Moniteur Belge*; the German quotations are taken from the *Deutscher Reichsanzeiger*, the prices for the German Empire representing the average of the prices at a number of markets. The mark is now taken as equal to 11·8*d.*, and the German prices for the former year have been recalculated on this basis.

AVERAGE PRICES of **British Wheat, Barley,** and **Oats** at certain Markets during the Month of January, 1907 and 1908.

—	Wheat.		Barley.		Oats.	
	1907.	1908.	1907.	1908.	1907.	1908.
	s. d.	*s. d.*	*s. d.*	*s. d.*	*s. d.*	*s. d.*
London...	27 3	36 3	24 2	26 7	18 1	19 6
Norwich	26 0	35 7	24 3	27 0	17 0	18 4
Peterborough	25 3	35 0	23 9	26 0	16 7	18 0
Lincoln...	25 9	35 7	23 11	27 1	17 1	18 1
Doncaster	25 7	34 8	23 8	26 8	16 9	18 3
Salisbury	25 7	34 9	23 8	26 3	17 10	17 9

AVERAGE PRICES of PROVISIONS, POTATOES, and HAY at certain MARKETS in ENGLAND and SCOTLAND in the Month of January, 1908.

(Compiled from Reports received from the Board's Market Reporters.)

Description.	London.		Bristol.		Liverpool.		Glasgow.	
	First Quality.	Second Quality.	First Quality.	Second Quality.	First Quality.	Second Quality.	First Quality.	Second Quality.
	s. *d.*	*s.* *d.*	*s.* *d.*	*s.* *d.*	*s.* *d.*	*s.* *d.*	*s.* *d.*	*s.* *d.*
BUTTER :—	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.
British ...	16 9	14 9	15 0	14 0	—	—	15 0	—
	per cwt.	per cwt.	per cwt.	per cwt.	per cwt.	per cwt.	per cwt.	per cwt.
Irish Creamery	126 0	122 6	—	—	—	—	—	—
,, Factory	112 0	103 0	105 0	102 0	108 6	102 6	—	—
Danish ...	125 6	123 6	—	—	128 0	126 0	126 0	—
Russian ...	112 0	109 6	—	106 0	107 0	102 0	110 0	101 0
Australian ...	117 6	115 0	119 0	117 0	118 0	116 0	120 6	117 6
New Zealand	120 0	117 6	122 6	120 6	121 6	119 6	122 0	—
CHEESE :—								
British—								
Cheddar ...	76 0	73 0	73 0	61 6	74 0 120 lb.	70 0 120 lb.	68 0	64 0
Cheshire ...	—	—	—	—	75 0 per cwt.	70 0 per cwt.	—	—
Canadian ...	64 6	63 6	64 6	62 0	64 0	62 0	65 0	61 6
BACON :—								
Irish	60 0	56 0	—	—	59 0	56 0	61 0	58 6
Canadian ...	51 6	49 6	52 6	48 6	50 6	48 0	52 0	50 0
HAMS :—								
Cumberland ...	109 0	100 6	—	—	—	—	—	—
Irish	99 0	91 0	—	—	—	—	82 0	74 0
American (long cut) ...	51 6	49 0	50 0	46 0	49 0	45 6	50 6	48 6
EGGS :—	per 120.	per 120.	per 120.	per 120.	per 120.	per 120.	per 120.	per 120.
British ...	16 0	13 9	16 0	—	—	—	—	—
Irish	14 10	13 8	13 6	—	14 0	12 7	13 2	11 7
Danish ...	14 5	12 11	15 6	13 6	14 5	13 9	16 0	14 6
POTATOES :—	per ton.	per ton.	per ton.	per ton.	per ton.	per ton.	per ton.	per ton.
Langworthy ...	113 0	104 0	107 0	97 0	105 0	100 0	87 0	82 0
Main Crop ...	109 0	101 0	107 0	97 0	105 0	100 0	—	—
Up-to-Date ...	105 0	94 0	103 0	92 0	81 6	76 6	80 6	76 0
HAY :—								
Clover ...	98 6	86 6	75 0	—	96 0	67 6	83 0	77 6
Meadow ...	82 0	69 0	67 6	—	—	—	62 0	57 0

DISEASES OF ANIMALS ACTS, 1894 to 1903.

NUMBER of OUTBREAKS, and of ANIMALS Attacked or Slaughtered.

GREAT BRITAIN.

(From the Returns of the Board of Agriculture and Fisheries.)

DISEASE.	JANUARY.	
	1908.	1907.
Swine-Fever :—		
Outbreaks	132	147
Swine Slaughtered as diseased or exposed to infection	536	607
Anthrax :—		
Outbreaks	104	71
Animals attacked	165	91
Glanders (including Farcy) :—		
Outbreaks	69	80
Animals attacked	195	150
Sheep-Scab :—		
Outbreaks	214	145

IRELAND.

(From the Returns of the Department of Agriculture and Technical Instruction for Ireland.)

DISEASE.	JANUARY.	
	1908.	1907.
Swine-Fever :—		
Outbreaks	14	16
Swine Slaughtered as diseased or exposed to infection	307	221
Anthrax :—		
Outbreaks	1	—
Animals attacked	1	—
Glanders (including Farcy) :—		
Outbreaks	—	—
Animals attacked	—	—
Sheep-Scab :—		
Outbreaks	80	49

(5,500 2 | 08—H & S 3007)

THE JOURNAL
OF THE
BOARD OF AGRICULTURE.

Vol. XIV. No. 12.

MARCH, 1908.

PRUNING FRUIT TREES.

WALTER P. WRIGHT.

(1) YOUNG TREES.

Pruning is one of the most important, and at the same time one of the most interesting, matters connected with the cultivation of fruit. Other things being equal, a well pruned tree will yield a much heavier weight of fruit in a given period than a badly pruned one. The fruit will be finer and of higher value.

To state an apparent paradox, the object of pruning should be to prevent the necessity for pruning. A tree that is properly pruned in its infancy, when it is small, and consequently quickly and easily dealt with, will need much less pruning when it reaches maturity than a tree that was neglected, or injudiciously dealt with, in its youth. It is for this reason that any consideration of the subject of pruning should begin with the young tree.

Fruit trees are raised by being grafted on to allied plants termed "stocks." As a matter of fact, the majority are budded, but it is in no way extravagant to speak of budding as a form of grafting. It is not proposed to deal with budding or grafting in the present article, but it may be said that the buds are inserted in summer, and if they fail the stocks are grafted in the following spring. In spring the tree is merely a "worked stock"; in autumn of the same year it is a "maiden" tree. The number of private growers who propagate fruit trees is inconsiderable; the majority purchase

trees which have been propagated by nurserymen. There are, however, a considerable number of market growers who raise their own trees, but judging by the results in many cases it may be doubted whether this is wise. The actual operation of budding or grafting is easy enough, and growers may succeed with it quite readily, but it is in the after management that failure so often occurs. A nurseryman, with years of experience behind him, knows just how to manage the young trees in order to develop them to the best advantage. A market grower may not possess this knowledge, and from want of it may handle his trees with so little judgment that they are spoiled.

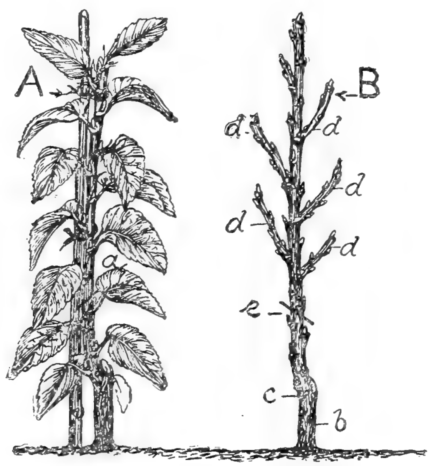


FIG. 1.—Maiden trees:—(A), sturdy tree in growth, not pushing laterals: (*a*), point of shortening at winter pruning. (B), strong growing tree with laterals: (*b*), stock; (*c*), junction of scion (apple) with stock (English Paradise); (*d*), laterals; (*e*), point of shortening for bush form of tree.

It is doing bare justice to the fruit nurserymen of this country to say that, in the main, their manipulation of young trees is guided by sound principles. They recognise the importance of securing a good foundation, and in order to get it they head the young trees back, nearly always twice, and sometimes three times. The maiden is always shortened, the two-year-old is generally shortened, the three-year-old is sometimes shortened. A young fruit tree that is not headed back, but left to break naturally, will always tend to become top heavy. The buds at the upper part will break into growth much in advance of the lower ones, and will secure a lead which they will always retain. The unshortened tree will, therefore, be

bare at the base. This is in itself a serious defect enough, but inasmuch as the top branches will in their turn present the same phenomenon of strong tip growth and weak basal growth, it follows that the tree will be constantly becoming more and more top heavy. The branches will be "whippy" and crowded.

A good fruit tree can only be built up by successive stages of pruning. It cannot be left to nature. The first stage is the pruning of the "maiden," and this should be looked upon as absolutely indispensable. It should be done severely, as half

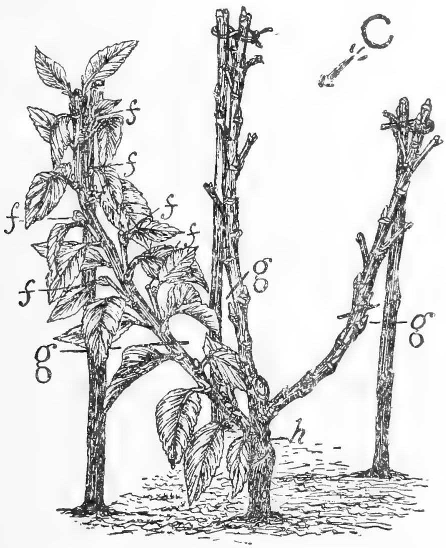


FIG. 2.—Second year's tree :—(C), tree B, fig. 1 : (*f*), laterals pinched to one leaf as made ; (*g*), points of shortening at winter pruning ; (*h*), stem from which all growths but the three shown have been removed at an early stage of the year's growth.

measures will only be attended by failure. Each tree may be shortened to six buds from the stock—that is to say, the pruner may count upwards from the stock, and having come to the sixth bud, boldly pass his knife through the shoot (Fig. 1). It helps to carry the succeeding shoot up in a true line with the main stem if the bud at which pruning is done is on the front of the stem, but this is not of great importance except for wall and trellis trees. The shoots may be thinned to three, choosing those which are the best placed.

The second stage is the cutting back of the shoots which

spring from the buds left when they have completed a season's growth. Some growers who do not hesitate to prune back a maiden are reluctant to shorten a two-year-old. Anxious to get a large tree as quickly as possible, they regard shortening as a waste of time. It is certainly not so, because it conduces to securing that habit of growth which renders the pruning of the matured tree a quick and easy process. Not only should shortening be practised, but it should be severe, only stumps a few inches long being left (Fig. 2), and the shoots breaking from the buds thinned to two on each stump, or six in all. This procedure means that the tree can concentrate its energies on a limited number of well-placed branches, growing at about equal distances apart, and away from the centre.

The third stage is the shortening of the six branches the following winter. Frequently this is not done. Nurserymen sell a great many trees in the stage when they are known as two-year-olds, and if they are precocious varieties, like the apples Stirling Castle and Bismarck, they may already have fruit buds on them. Purchasers of healthy young trees, with or without buds, are notoriously averse to shortening them, but the trees certainly ought to be shortened again. This pruning need not be so severe as the two previous ones; indeed, it will suffice if the branches are cut back about one-third their length (Fig. 3).

This line of action leads to a tree carrying about a dozen main branches, all evenly disposed, and growing in the right direction. There is no waste of space, but on the other hand there is no crowding. These twelve branches form the framework of the tree. They are either the fruiting wood itself or (as in young wood bearers) the support for the fruiting wood. Apples, pears, plums and cherries may all be developed on the lines indicated, and in every instance the labour of subsequent pruning will be materially reduced. It will be open to rapid accomplishment with knife or sécateurs ; there will be no slow and tedious labour with the saw.

All the wood in these young trees should be clean and healthy. This is helped if care is taken to prune close to the bud. If the implement used is passed through the shoot half an inch or more above a bud, the stump so left, which is called by gardeners a "snag," will decay. A young tree full of dead snags does not present a neat and healthy appearance,

moreover, the decaying stumps afford a seat for the spores of fungi.

As between knife and sécateurs, the former has a slight advantage in cleanliness of cut, the latter in speed. Neither possesses any marked superiority in the case of young trees, but for these the knife is generally given the preference, while for older trees the sécateurs enjoy the most favour.

FIG. 3.—Third year's tree:—(D), tree C, fig. 2: (*i*), spurs (stubby shoots with rounded bud) not to be shortened; (*j*), side shoots not required for forming branches, stopped during growth at the third leaf (not counting small basal leaves), and cut back at the winter pruning to a couple of buds as shown by the cross lines; (*k*), spur-like buds (sometimes blossom buds), otherwise forming spurs the following season; (*l*), points of shortening. The numerals indicate years of growth and pruning.

Root pruning is so generally associated with old-established trees that the mention of it in connection with young trees which are in course of development may sound strange. It is precisely with these, however, that the operation is likely to be attended with the most beneficial results. As a matter of fact, a rough and ready system of root pruning is regularly conducted in the ordinary routine of nursery work. Trees of a given age are grown together in large "drifts," and after the sale season is over large gaps are found among them, the

result of trees being lifted to supply customers. It would not be economy of ground to leave the drifts in this state, and so the unsold trees are lifted. The replanting serves as root pruning, and the trees get that fibrous root system which growers appreciate so much. When, however, the trees which have been purchased by customers have been established for a year or two in their new quarters, possibly in very rich soil, they may again acquire a coarse root system, and the branch growth become too luxuriant to be fruitful. Lifting and root pruning are then of the greatest benefit, and it should be remembered that the operation can be performed far more easily and expeditiously two years after a young tree has been planted than when it has been established ten years. At the latter stage a great deal of soil may have to be shifted before the roots can be found at all, especially if the trees are on free or crab stocks.

The extent to which the head of a three-year-old bush should be reduced when it has been purchased at a nursery and planted in a private or market garden has formed a subject of controversy among growers. If the tree has been thrice shortened in the nursery it should certainly possess a good foundation. It may have a few fruit buds on it. Such a tree need not be cut in so severely as a young standard, as the wood will probably be firmer and riper, and in any case it will not be so much exposed to wind-sway. It will, however, be wise to shorten the shoots to the extent of about one-third, and also to pick off the fruit buds, so that the tree may not have the strain of bearing during the first season. Advice of this nature is not palatable to many amateurs, who are invariably anxious to get fruit at once, and for whose benefit the nurseryman develops a special class of tree well bristling with fruit spurs, but no tree has ever yet been injured by fruit suppression in the first planting season, whereas thousands have been checked by the want of it. This matter of pruning young trees after removal from the nursery might be discussed at some length, as it is of considerable importance, but as it was dealt with in detail by the present writer a few months ago* it is hardly necessary to go over the whole ground now. A few general principles may however be mentioned.

* *Journal*, Vol. XIV., No. 11, February, 1907, p. 660.

In the first place, a distinction should be drawn between trees planted in autumn and those planted in spring; the former being pruned at once, and the latter not until the upper buds have broken well into growth. Secondly, pruning should always be to an outside bud, in order to throw the resulting upper shoot out from the tree instead of inwards. Thus, the crossing, and consequent rubbing, which results when some branches are growing towards the centre of the tree, and some away from it, are avoided. Thirdly, a sharp tool should always be used, in order that a clean cut, which will quickly heal, may be made. Fourthly, weak growers should be pruned more severely than strong ones. It is unwise to head back bushes of such vigorous apples as Annie Elizabeth, Blenheim Orange, Bramley's Seedling and Emperor Alexander repeatedly, because it tends to fill them with gross wood. Varieties of this character should be restricted to a given number of shoots (twelve will suffice) well clear of each other, all others being cut clean out. Only the soft tips of the permanent branches should be pruned in. If there are any fruit buds on them when purchased, which is unlikely, they may be picked off. This class is slow to come into bearing, but crops abundantly when the wood gets well matured, and has developed its spurs.

Soft fruits, such as currants and gooseberries, may be developed in much the same way as hard fruits. Both are raised from cuttings inserted in late summer or early autumn. In the nurseries they are lifted, and root and branch pruned, a year after insertion. At the end of another year's growth the shoots are again shortened, and so the foundation of a vigorous, open bush is secured.

In the present paper attention has been restricted to the development of young trees; in a second one the pruning of established trees of all the principal kinds will be discussed.

ADVANTAGES OF GOAT-KEEPING.

"HOME COUNTIES."

Although goats have long been kept in this country, it is only of recent years that "the poor man's cow" has begun to receive public recognition in Great Britain. Goats are now exhibited in some numbers at the Dairy Show and at many of the

County Agricultural Shows. By the introduction of foreign blood, not only the size and comeliness, but the milking powers of the nannies have been increased. People who have never met with any goats other than the chance-bred aboriginals of the United Kingdom have no notion of the appearance or value of a good goat, but in Switzerland, France, Germany and Scandinavia, the value of the goat as a milk producer has been developed to a remarkable degree.

An advantage offered by the goat as a milk-producer lies in her small size and accommodating ways in the matter of food. Another point in the goat's favour is the quality of her milk, sometimes nearly twice as rich as cow's milk. A third argument for goat's milk is that the hardy animal which yields it, though not immune to tuberculosis, is seldom attacked by that disease.

Quality of Goat's Milk.—As to the richness of goat's milk, the following tables speak for themselves :—

FROM Stevenson and Murphy's "Treatise on Hygiene and Public Health."

Milk.	Total Solids.	Proteids (Flesh-formers).	Fats.	Milk Sugar.	Salts.	Water.
Goat's	14·29	4·29	4·78	4·46	0·76	85·71
Cow's	12·83	3·35	3·69	4·88	0·71	87·17
Human	12·59	2·29	3·78	6·21	0·31	87·41

ANALYSES by Dr. Voelcker of Goat's Milk in comparison with Milk drawn from the Winner of the Milking Prize at one of the Dairy Shows.

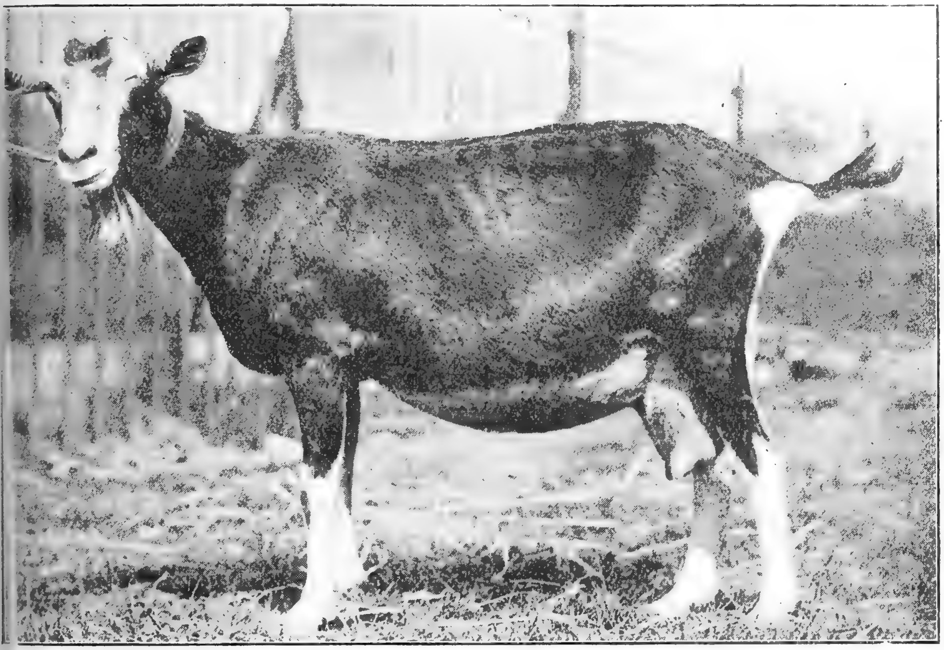
Milk.	Casein.	Butter Fat.	Milk Sugar.	Water.
Goat's*	4·18	7·30	4·10	83·21
Cow's	—	3·63	8·81†	87·56

* Ash 1·21 to be added. † Includes casein and ash.

Goats' milk is particularly serviceable in the case of infants, for whom doctors are increasingly recommending it.

The belief that goat's milk has "a taste" is founded on acquaintance with milk which has been kept in dirty vessels, or is old, or is the product of a goat which has had access to ivy, garlic, or some other strong-scented food. Unwatered goat's milk tastes richer and sweeter than cow's, and unprejudiced people who have the choice generally prefer it.

Suitability for Small Holders.—Owing to their small size and accommodating nature in respect of food, no one can derive more advantage from goats or manage them more conveniently than the small holder and the cottager. A goat does not do well on meadow grass alone. It needs variety in its food. No hay pleases it so well as that which is made of the mixed herbage growing at the roadside or along the hedges. Garden refuse is particularly acceptable to goats and they appreciate all sorts of green stuff, leaves, prunings, potatoes,



"SEDGEMERE FAITH," ALPINE GOAT.

bread, horse-chestnuts, acorns, and, of course, roots, corn and mashes. They eat some things not considered good for cattle, but it is well to prevent them having access to privet berries, cut yew, rhododendrons, monks-hood, lords and ladies, fox-gloves and sweet briar, though healthy goats ordinarily avoid these things.

Tethering.—If goats can be given their liberty on a common or hillside, this is much the best way of enabling them to pick up their living, but many goats must, of necessity, be tethered. This can be done with an iron peg, provided at its head with

a ring which moves round it easily. Attached to the ring is the tethering chain or rope with swivels in it. An ingenious form of swivel is shown in the illustration. By its use the area of grazing ground can be enlarged from time to time. With the ordinary chain it is necessary to shift the peg several times a day. The goat should wear a leather collar, of the sort made for large dogs.

It is absolutely necessary that the tethering arrangement shall be well-made and work perfectly. Goats on obtaining their liberty will quickly destroy trees by barking them, and no hedge can stand against them. Being strong animals they soon loosen a badly-driven peg. It is a good plan to give goats the opportunity of barking faggot and other wood before it is used for firewood.

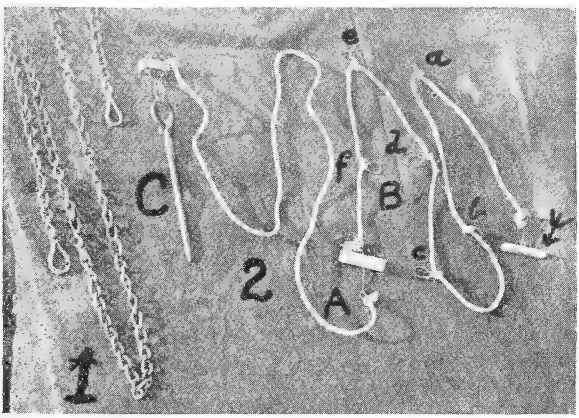
Goats do well even when wholly confined to an exercising yard, if it is roomy and sunny. This plan simplifies feeding, and, with care in littering, provides a quantity of excellent manure. Goats so kept need to have their hoofs pared from time to time, but this is a perfectly simple operation.

Feeding.—In placing hay, green stuff, or indeed any food before goats, it is necessary to arrange it so that it cannot be wasted. Food which falls to the ground is not eaten. An economical way of feeding with hay is to place it in a box which the goat can only reach by putting its head through a hole in its stall. Green stuff should also be put in the bottom of a box or in a rack with close staves. Pails in which food or water is supplied should be dropped into a wooden frame so that they cannot be upset. A lump of rock-salt, placed in a box where it can be licked, is relished by goats.

Mr. H. E. Hughes, an experienced goat-keeper, feeds his goats in winter as follows:—Morning, coarse middlings and bran, or oats, hay and water. Mid-day, hay. Evening, bran and oats, chopped mangel and bran, green food (all possible), water, hay and salt. Mr. Bossert, who has a large herd, feeds as follows:—Middle of May to middle of August, grass and hedge stuff. During winter months, hay and roots at 8 a.m., acorns, cabbage and oats at noon; bran (quart to each), or a little crushed oats or barley, hay and roots at 8 p.m. Mr. Woodiwiss's dietary is as follows:—Summer, grass by day, lucerne at night. Winter, cabbage or mangel and bran

for first meal; oats for second; hay for third. Tree branches and hedge trimmings when available.

The small holder and cottager can utilise all sorts of odds and ends. The great thing is to vary the food as much as possible and to give enough, but not too much. All corn is appreciated by goats, but a very little is sufficient. It is a good thing to dry pea-bines and such things in the summer and store them along with the hay. By taking thought the cost of feeding goats in the winter can be reduced to a low figure. Even the dietary of bought foods adopted by Mr. Hughes does not cost all the year round more than sixpence a



1.—Ordinary spring hook and swivel tethering chain; 2.—Extending tether. (A), the tether; (B), extension rope attached to (A) by wooden toggle; (C), peg to be driven in ground. The length of the tether can be increased by inserting the toggle in the loops *a*, *b*, *c*, *d*, *e*, *f*, as may be desired.

week. Other goat-keepers put the cost of goat-keeping at various sums between 3*d*. and 4*d*. per week to 1*s*. 6*d*.

Although goats will eat "almost anything," the food must be clean and be placed in clean vessels. Nor must the animals be suddenly taken from dry or dryish foods to grass or vegetables, or "scouring" will result. Although, too, goats are not hard to please in the matter of housing, they must have air and ample ventilation along with freedom from draughts.

Housing.—Many goats, like dogs, seem to prefer to sleep on benches rather than on litter. It is best to give them the choice of bench or litter. Litter is necessary to keep the house dry and sweet unless it is cleaned out daily, which is an uneconomical proceeding when there is a garden or land needing

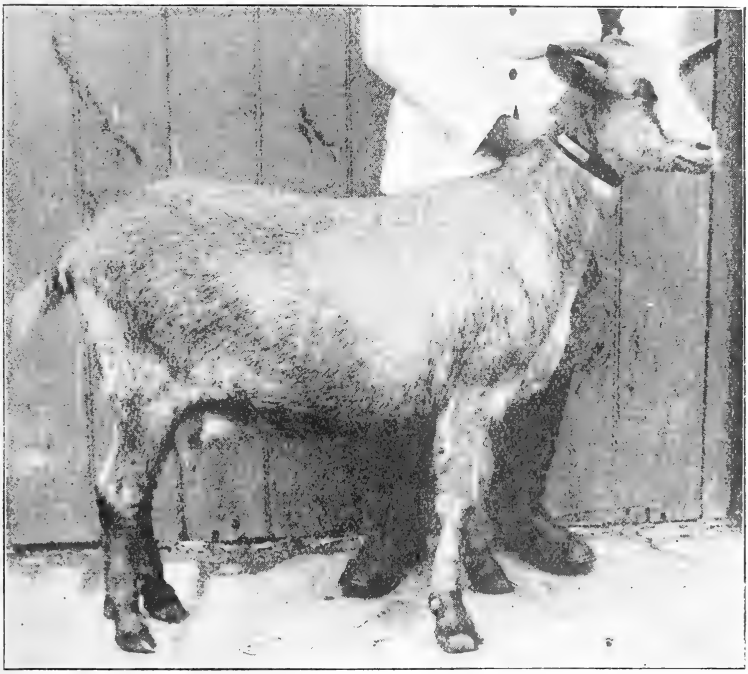
manure. If a number of goats is kept, housing in pairs in stalls, four feet square, is a good plan; but, needless to say, this must be in an airy building. When there are only a few goats, they can be left loose in their sleeping building and be provided with a bench apiece to use as inclined. If the door of the house is left open the animals can come out into the yard early in the morning. In the summer time the animals will probably prefer sleeping in the open if the yard be littered, as it should be in order to save droppings and urine.

Utilisation of the Milk.—With three goats, got to kid at different times, a continuous milk supply can be obtained. In many rural districts, owing to the farmer's milk being sent off by rail, there is a dearth of milk among cottagers. In other districts, where dairy farming is not followed, milk can only be got from farmers as a favour, so that goats are a great boon. In these areas there are often "week-enders" and other householders who might be customers for goats' milk and in the vicinity of residential districts and pleasure resorts a profitable demand for goats' milk might be worked up by the recommendation of the medical profession.

Yield of Milk.—The maximum yield is not usually obtained at the first kidding. Many common goats do not give two quarts of milk daily, but unless food can be obtained cheaply, no goat should be kept which gives less than this quantity at kidding. Such an animal costs as much to keep as a better one. "Two quarts at least, dropping gradually after a few months" is the formula for the goat-buyer who has much food to buy. The following table of the average yields obtained at the milking competition at the 1906 Dairy Show may be taken as an indication of the production of good goats :—

Name of Goat.	Days since Kidding.	Weight of Milk.	
		Morning.	Evening.
		Lb.	Lb.
Sedgmere Faith	174	3·80	3·80
,, Melba	195	1·75	1·50
,, Capella	196	1·75	1·55
,, Sunbeam	257	1·70	1·55
,, Louise	228	2·00	1·90
Montbretia	193	1·10	1·40
She	209	1·15	1·35
Diamond Queen II	245	2·00	1·80

Price of Goats.—Goats yielding less than two quarts at kidding and occasionally goats giving more can be picked up at low prices. Among the goats brought over from Ireland, animals may sometimes be found which are excellent value. Ordinarily, the price of goats is about £1 a quart up to two quarts. Above that yield the rate rises. No owner of a gallon goat would sell it for less than £10. A five-pint goat would be cheap at £2 10s. and is seldom obtainable at that price. Owing to the increasing interest in goat-keeping, good goats are



"SEDGEMERE SUNSET," ANGLO-NUBIAN.

advertised for sale, and prices have risen; but in many rural districts serviceable goats can be got for sums within the small holder's reach. The Rev. E. P. Boys-Smith observes: "A goat which will give 600 lb. of milk, say 2 lb. daily, during ten months, does fairly well in the way of profit. Of course she will give much more daily during her second, third and fourth months than in her eighth, ninth and tenth; probably she will give five times as much. But it is not too much to look for 800 lb. instead of 600 lb., and exceptional goats will range

up to 1,200 lb. or more, though the upper limit is very exceptional. Assuming a goat of no particular breeding, which yields 700 lb., its worth may be put at about £3 to £6, according as it is to be sold just after kidding, or just before going dry. But in point of fact one may meet with such a goat at any price between 15*s*. and £15."

When prices are so uncertain the safe thing to do is to reckon the value of the goat by the value of the milk it will yield. As to the signs of a good milker, though many persons are learned in these indications, and some pin their faith to breeds, the probabilities are that the novice will do best by buying a goat solely on a written guarantee of health and of milking powers. If she does not, within a week, answer the promises made she can be returned. Mr. Woodiwiss, who has had as many goats through his hands as anyone, believes in the following indications of a good milker :—" Fine head, intelligent eye, lean long neck, narrow front, deep, well-sprung ribs, broad across tips, well placed and developed teats, plenty of leather for the making of an udder."

Price of Milk.—Goats' milk is sold in some places at fancy prices. On the basis of the analyses which have been quoted it is certainly worth from 5*d*. to 6*d*. a quart as against the 3*d*. or 4*d*. charged for cows' milk. Users of goats' milk always reckon it " goes farther " than cows' milk. In the following balance sheet, prepared with the assistance of a goat-keeper of great experience, the goats' milk is credited at 5*d*. a quart :—

EXPENSES.

	£	*s.*	*d.*
To yearly loss on a three years' old goat, bought for £3 10*s*. and sold for £1 10*s*. locally in about two years' time (goats are supposed to reach their best at 6 years, but many are valuable above that age) reckoning interest	1	2	0
,, food, stud fee (usually 1*s*.) and incidentals	2	12	0
,, contribution in respect of labour and housing	1	0	0
	£4	14	0

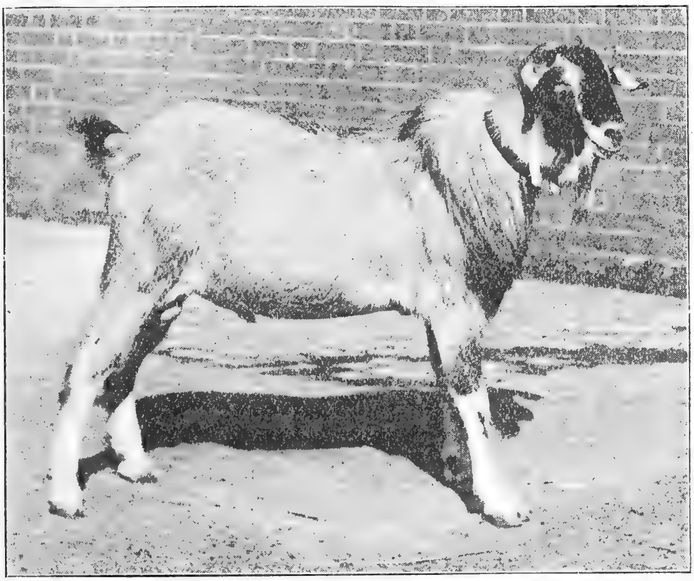
REVENUE.

	£	*s.*	*d.*
To Milk. Say $1\frac{1}{2}$ quarts daily for 6 months, 1 quart for 3 months, $\frac{1}{2}$ quart for 1 month = 379 quarts for 10 months at 5*d*. ...	7	17	11
Balance by profit	£3	3	11

If we add £1 to the expenses side there is still a profit of £2 3*s*. 11*d*., but the small holder ought not to need to make

this addition. At 4*d*. a quart the value of the milk would be £6 6*s*. 1*d*. instead of £7 17*s*. 11*d*.

Disposing of the Kids.—It is not possible to add anything to the credit side in respect of kids, for the most economical plan is to kill them instantly on birth, unless they are nannies from a good milker which was mated to a billy, the son of a good milker. By the time kids have reached the age at which they are usually sold they have drunk not far short of 15*s*. worth of milk. Kids must be killed one by one as they are born. This can easily be done by stunning them



"SEDGEMERE SERGIUS," ANGLO-NUBIAN TOGGENBURG.

behind the ears with a cudgel. They can be painlessly destroyed in this way without making a sound and without distressing the mother. It is not difficult to distract her attention for the moment. If she is allowed to retain the kids until she has washed and suckled them, the cruelty of her loss will be evident and she will bleat—or rather make a distressing noise much louder than bleating—for some days. If the owner of a goat allows her to keep her kids she will not "let down" much milk to him but will "hold back" the bulk for her offspring. Kids can be eaten at a few weeks old, though roasted kid is rather a dear viand. The keeping of

the kids for a time seems to spoil the mother's yield for that kidding. It is also an inhumane proceeding to keep kids till their mother has become attached to them and then to take them from her. It is quite possible to rear kids with a bottle.

Breeds.—A higher price is asked for a pure-bred goat than for an animal of uncertain ancestry. The foreign blood introduced into this country is chiefly Swiss and Nubian. The advantage derived from the blood of foreign goats is two-fold. In the first place, particularly in the case of Swiss animals, they have been bred for generations for milking capacity. The other advantage is that they usually breed more freely than our native animals. It is the nature of the goat to breed once a year in the spring. With foreign blood or an infusion of foreign blood it is possible to breed at other times than the spring. An authority has expressed the opinion that "anyone could have milk all the year round with three Anglo-Nubians."

Many of the best goats in this country are called Anglo-Nubian. They may be black, brown and black, white, and any mixture of these markings, and still claim the name of Anglo-Nubian. The most generally esteemed among the Swiss varieties is the Toggenburg. There is now a large number of Anglo-Toggenburgs, Anglo-Toggenburg-Nubians, and Anglo-Toggenburg-Anglo-Nubians in the United Kingdom. Alpine and Saanen are two commended varieties. It is doubtful if there is any "best breed." As in the case of the development of laying powers in hens, milking powers may be increased in most breeds by systematic breeding from good milkers, mated to the progeny of good milkers, with due attention to stamina and the avoidance of in-breeding.

Breeding.—The best way of getting nannies in season out of the usual breeding period is to keep them for a time in the vicinity of a billy. No one will go to the trouble and inconvenience of owning a billy of his own who can get the services of a neighbour's for a shilling. The billy-goat is a creature of filthy habits and he emits a noisome odour, but the general impression that the nanny has also a smell is baseless.

The period of gestation in the goat is about 150 days. She has usually two or three kids at birth, but occasionally there are

four. The animals do not need assistance at parturition. The signs of approaching parturition are a certain uneasiness in the nanny's demeanour, a swelling of the vulva and an excretion of mucus. A short time before the kids are born the goat's body seems to drop a little. A healthy nanny stands while having her kids.

It is usual among many goat-keepers to send the nanny to the billy when she reaches a year and a half. A wagging of the tail, and a manifest uneasiness are the signs of wishing to go to the billy. Oestrum lasts only three days.

Milking.—Milking is easily managed. The goats of the writer jump on a bench to be milked, and thrust their heads through a guillotine arrangement so that they can be kept still. He sits down on the edge of the bench facing the udder, grasps the goat's far leg with his left hand and milks with his right. Sometimes he holds the can instead of the nanny's leg with his left hand. Gentleness in milking is absolutely essential to a good yield. A massaging of the udder before or in the middle of milking is desirable. The udder should be washed with a sponge or cloth and warm water before milking. Unless every drop of milk is drawn the animal's "drying off" will be hastened. The last-drawn milk is the richest.

The milk should be strained and set to cool in an open vessel immediately after milking.

Disease.—There appears to be "a disease peculiar to goats," of microbic origin, but where goats are kept under healthy conditions they are not likely to have any ailments of consequence, beyond "scours," which can be gradually stopped by a timely change of diet.

There are three books about goats :—"The Book of the Goat," by H. S. Holmes Pegler (Upcott Gill, 4*s.* 6*d.*, 1886), "Milch Goats," by Bryan Hook (Vinton, 3*s.* 6*d.*, 1896), and "The Case for the Goat, with the Practical Experience of Twenty-four Experts," by "Home Counties" (Routledge, 3*s.* 6*d.*, 1908). The British Goat Society publishes a Monthly Register and a Herd Book, and the secretary is Mr. H. S. Holmes Pegler, Allerton House, Kingston-on-Thames.

THE POISONOUS PROPERTIES OF THE BEANS OF *PHASEOLUS LUNATUS.*

PROFESSOR WYNDHAM R. DUNSTAN, F.R.S., LL.D., AND T. A. HENRY, D.Sc.

In 1901 the Imperial Institute received for investigation from the Director of the Station Agronomique, Mauritius, the beans of *Phaseolus lunatus*, a plant grown in that Island for use as a green manure, the dark coloured beans of which had proved to be poisonous. It was found on investigation that these beans were capable of yielding considerable quantities of prussic acid, the origin of which was traced to the presence of a glucoside, to which the name phaseolunatin was given, and a ferment, which was able to decompose the glucoside with the formation of prussic acid.

A full account of this glucoside is given in a paper communicated by us to the Royal Society (*Proceedings of the Royal Soc.*, 1903, LXXII, 285). While this work was in progress, samples of beans known commercially as Paigya, Rangoon, or Burma beans, which were then being imported into this country in large quantities, were sent to the Imperial Institute for an opinion as to their suitability as feeding stuffs by various firms to whom consignments had been offered. Two varieties of these beans occur in commerce—the one pink, with small purple splotches, and distinguished as "red beans," the other pale cream in colour and known as "white beans." Numerous samples of the red beans were received, and each of these on examination was found to yield minute quantities of prussic acid. Only one sample of the white beans was received at this time, and from that no prussic acid could be obtained.

The red and white Rangoon beans, though as a rule lighter coloured, smaller and less shrivelled than the Mauritius beans, exhibited certain resemblances, which indicated that they also were derived from *Phaseolus lunatus*. Such marked differences in colour as were shown by the three varieties are well known to occur in species of this genus, and from information subsequently received from India there appears to be no doubt that these Rangoon, Burma or Paigya beans are produced by *Phaseolus lunatus*, the beans of which have long been known

in India to be poisonous under some circumstances. Other vernacular names in use for these beans are "Lima" and "Duffin," the former being in common use in the United States.

In view of the fact that the white Rangoon beans examined at the Imperial Institute yielded no prussic acid, attempts were made to obtain the white beans of *Phaseolus lunatus* grown in other localities than India for comparison with them, and eventually "Haricots de Lima," grown in the South of France, were obtained through a firm of seedsmen in Paris. These were much larger than either the Mauritius or Indian beans and were cream white in colour. They were examined and found to furnish no prussic acid.

These observations that the red Rangoon beans yielded traces of prussic acid, and the white beans from two different sources none, confirmed the statements recorded by various authors that the white beans of *Phaseolus lunatus* are safer than the red kinds. Thus Professor Church, in his "Food Grains of India" (p. 155), says :—"This is one of the species of *Phaseolus* which sometimes exhibits marked poisonous properties. It is desirable that great care should be taken in selecting for cultivation the best variety of Lima beans. The large oval white seeded kinds, with at most a brown or black mark close to the hilum, are preferable to those with flattened reniform seeds having blotches of red or veinings of black."

On this point it is of interest to note that Cordemoy has stated ("Flore de l'île de la Réunion," 1895, p. 389) that in the wild state the beans of *Phaseolus lunatus* are purple and very poisonous ; that on cultivation the colour of the seed becomes modified to a yellowish tint with stripes or violet splotches, and that in this state the beans are rarely poisonous ; and lastly that, after prolonged cultivation, large white beans are produced which are harmless. This statement, taken in conjunction with the facts recorded above, seemed to indicate that by cultivation of the plant the beans become white and then no longer produce the glucoside capable of yielding prussic acid.

After carefully reviewing the facts in consultation with the Director of the Imperial Institute, the Board of Agriculture came to the conclusion that it was desirable at this stage to warn consumers against the use of red and dark coloured beans of *Phaseolus lunatus*. (*Journal*, December, 1902, p. 373.)

In 1905 interest in the matter of the production of prussic acid by the beans of *Phaseolus lunatus* was reawakened by the importation into the United Kingdom of large quantities of beans from Java, to the use of which, for feeding cattle, numerous cases of poisoning were traced, especially in Scotland.*

Samples of these "Java beans" were received at the Imperial Institute from various firms. They closely resembled the beans of *Phaseolus lunatus*, as received from Mauritius, and on examination proved, like these, to yield comparatively large quantities of prussic acid. These "Java beans" were imported, not only into the United Kingdom, but also into Holland, Germany and France, and in all three countries similar poisoning cases occurred.

At this period a systematic investigation of the beans of *Phaseolus lunatus*, as produced in different localities, was undertaken by Professor Guignard ("Comptes Rendus," 1906, CXLVII, 545), and an examination of Java beans was made by M. Kohn-Abrest (*ibid.*, p. 586). Both these investigators confirmed the observations made at the Imperial Institute that the Java beans yielded comparatively large quantities of hydrocyanic acid. Professor Guignard also found that red Rangoon beans yielded small amounts of prussic acid, but he stated that the white cultivated beans of *Phaseolus lunatus*, such as those produced in Madagascar, Rangoon, Southern France, &c., also yielded prussic acid, though in most cases only in mere traces.

Messrs. Tatlock and Thomson examined a number of commercial samples of Java, Rangoon and haricot beans, and their results, which also indicate that some samples of the white beans of *Phaseolus lunatus* yield prussic acid, are given in the *Analyst* for August, 1906.

In March, 1907, Mr. Hendrick, chemist to the Highland and Agricultural Society of Scotland, sent to the Imperial Institute a sample of white Rangoon beans, which he had found on examination yielded ·016 per cent. of prussic acid.

In May, 1907, the Board of Agriculture called the attention of the Director of the Imperial Institute to the fact that white Rangoon beans had been found in some instances

* *Journal*, March, 1906, Vol. XII, p. 742, and April, 1906, Vol. XIII, p. 52.

to yield prussic acid, and as it seemed desirable that the matter should be further investigated, a request was made to the Board of Agriculture for samples of Rangoon beans as sold throughout the United Kingdom for feeding purposes. A series of such samples, collected mainly in Scotland and the North of England by one of the Board's Inspectors, was received last July.

The Imperial Institute also obtained a number of samples of white Burma beans and other white beans of *Phaseolus lunatus* from firms in London and Paris, so that the inquiry could be made as general as possible.

The results of the examination of these samples are given in the following table:—

SAMPLES received from the Board of Agriculture.

	Prussic Acid. Per cent.
Red Rangoon beans, obtained at Leith...	0·024
White ,, ,, ...	Traces, too small to estimate.
Hand-picked white Rangoon beans, obtained in Newcastle	0·020
White Rangoon beans, obtained in Newcastle	0·018

SAMPLES received from London Dealers.

		Prussic Acid. Per cent.
Firm A	White Rangoon beans	0·025
	,, ,, hand-picked	0·027
Firm B.—	White Burma beans	0·026
Firm C.—	Tinned white Lima beans of American origin ...	None.

SAMPLES Received from Seedsmen in Paris, and Guaranteed to be Produced by *Phaseolus lunatus*.

	Prussic Acid.
Haricot de Lima, large cream	None.
,, Sieva	Traces, too small to estimate.

These results indicate that, whilst there are varieties of the white beans of *Phaseolus lunatus* on the market which yield no prussic acid, some of the white Rangoon or Burma beans at present available in commerce yield this substance in quantities of some importance having regard to their use as a feeding stuff, whilst others, such as the white Rangoon beans obtained at Leith, yield mere traces.

It should be pointed out, however, that the quantities of prussic acid yielded both by red and white Rangoon beans are much smaller than those obtained from the Java and Mauritius beans. As a very large number of determinations of the amounts of prussic acid yielded by these various classes of beans have now been made, it may be useful to summarise the results in tabular form.

Origin and Colours of Beans.	Dunstan, Henry and Auld.	Guignard.	Kohn-Abrest.	Tatlock and Thomson.
	Prussic acid per cent.	Prussic acid per cent.	Prussic acid per cent.	Prussic acid per cent.
JAVA.				
Mixed beans of all colours	0·038–0·123	0·052–0·012	—	0·027–0·137
Black beans...	0·107	0·046	—	0·042
Purplish-black beans ...	0·116	—	0·052	0·031
Wine-red beans	—	—	0·058	—
Reddish-brown beans ...	—	—	0·037	0·038
Bright maroon beans ...	—	—	0·050	—
Light brown beans with dark spots	0·103	—	0·041	0·038
Pale brown with dark spots	0·104	—	0·126	—
Cream white	0·105–0·110	0·052	0·037	0·027
Black with white stripes ...	0·062	—	0·058	—
MAURITIUS.				
Purplish-black	0·088	—	—	—
Brown	0·087	—	—	—
Light brown	0·041	—	—	—
BURMA.				
Pale brown with purple spots	0·004–0·024	0·011	—	} 0·0009
Cream white	Nil–0·027	0·006	—	
FRANCE.				
"Haricots de Lima," large cream	Nil.	Traces.	—	—
"Haricots de Sieva," large cream	Traces.	0·004–0·008	—	—
"Haricots de Cap Marbre"	Traces.	—	—	—
MADAGASCAR.				
White	—	0·008	—	—

In addition to the foregoing, a number of miscellaneous samples of beans have been received at the Imperial Institute for examination in connection with this inquiry, and as one of these, which is probably not the product of *Phaseolus lunatus,* also yields traces of prussic acid, it may be of interest to record the results here.

SAMPLES received from the Board of Agriculture.

	Prussic Acid.
"Large white haricots" obtained in Glasgow ...	Nil.
"Small white haricots," said to be of Hungarian origin	Nil.

SAMPLES obtained from Firms in London.

		Prussic Acid.
Firm A.	"Butter beans," large white	Traces
	"Dark red haricots"	Nil.
Firm B.	Danubian beans...	Nil.

SAMPLES obtained in Paris.

	Prussic Acid.
Haricots d'Alger, blanc à ramés	Nil.
Haricots d'Alger, noir à ramés	Nil.

It is of interest to note that the "butter beans" now largely sold for human food in this country furnish traces of prussic acid, but the other "haricot" beans included in this group, which are probably mainly, if not wholly, derived from *Phaseolus vulgaris,* yield none.

It will be seen on comparing the results quoted in these two sets of tables that all the earlier analyses indicate the production by white Burma beans of no prussic acid or only traces; fairly large quantities (0·016 to 0·026) per cent. have so far as is known only been recorded for consignments of white Burma beans imported during 1907. Even these quantities are, however, only about one-fifth of those yielded by some specimens of Java beans, which were coloured.

No explanation of this unfavourable change in the quality of white Burma beans can be given at present.

It has been suggested recently by the French Consul at Rangoon that consignments of Rangoon beans may contain

small quantities of the poisonous beans of *Psophocarpus tetragonolobus*, and that their production of prussic acid may be due to such inclusions. The only extraneous beans noticed in samples, both of Rangoon and Java beans examined at the Imperial Institute, have been those of *Dolichos lablab*, which Dr. Leather has shown also yield small quantities of prussic acid. None of the investigators who have worked on Rangoon beans have recorded the occurrence among them of *Psophocarpus tetragonolobus* beans, so that there is no evidence to support the Consul's suggestion, whilst there is plenty of evidence that the Rangoon beans themselves actually yield prussic acid.

Although both red and white Burma beans have been imported in large quantities into the United Kingdom, and used for feeding cattle during the last few years, no cases of poisoning have so far been traced to them, but it is obvious that if the amount of prussic acid furnished by different consignments of these beans may vary over as wide a range as is shown by the figures quoted above, the use of these beans for feeding cattle may be attended with some danger.

There is nothing on record to show what ill effects—if any—are produced by the long-continued use of feeding materials capable of producing small quantities of prussic acid, but the following facts are of some interest in this connection. It was shown by Jorissen and Hairs as long ago as 1888 that ground linseed when placed in contact with water yields prussic acid, and these authors found that this was due to the interaction of a glucoside and ferment. Recently, in conjunction with Dr Auld, we have re-examined the glucoside and ferment of linseed and found that they are identical with the cyanogenetic glucoside and ferment of the beans of *Phaseolus lunatus*. (*Proc. Roy. Soc.*, 1906, B. LXXVIII, 152). Since in the mere expression of oil from linseed the glucoside is not destroyed, it became of interest to ascertain how much prussic acid is furnished by the linseed cake commonly used as a feeding stuff for cattle in this country. Samples of linseed cake were therefore obtained from two of the principal makers of this product in the United Kingdom. The samples of cake were both of the highest quality, and the linseed from which they were made was guaranteed by the firms to contain a minimum of

98 per cent. of true linseed. The amount of prussic acid yielded by the two samples was estimated and found to be as follows :—

	Prussic Acid. Per cent.
Sample No. 1	0·035
,, No. 2	0·041

These quantities it will be seen are about 50 per cent. greater than those obtained from any of the samples of Burma beans examined. Although cases of the poisoning of cattle by the green stems of linseed have been recorded in India, there are, so far as is known, no cases of poisoning of cattle by linseed cake on record in this country.

There is, however, one important difference between the "availability" of prussic acid in the beans of *Phaseolus lunatus* and in the linseed cake of commerce. The former when ground and placed in water develop prussic acid immediately, but no prussic acid is formed when ground linseed cake is placed in water. This difference appears to be due to the fact that linseed cake is now made by hot expression of the oil, and the heat applied in this process is sufficient to destroy the activity of the ferment, to the effect of which on the glucoside contained in the linseed, the liberation of prussic acid is due. There is, however, always the possibility that the prussic acid-yielding glucoside may be decomposed by ferments present in other feeding stuffs used along with the linseed cake, even if it is not acted on by intestinal ferments after ingestion.

In connection with this subject it may be of interest to mention what is known regarding the use of cassava in tropical countries. Two varieties of this plant, the bitter and the sweet, are known, and it was long supposed that only the roots of the bitter sort yielded prussic acid and were toxic. Recent investigations have, however, shown that at least in the West Indies both the sweet and bitter varieties yield similar amounts of prussic acid. Our investigations have shown that the origin of prussic acid in cassava is the same as in the beans of *Phaseolus lunatus* and linseed, viz. :—the interaction of phaseolunatin and a ferment. (*Proc. Roy. Soc.*, 1906, B. LXXVII, 152). In preparing meal from cassava roots these are usually rasped into a coarse powder and the

latter thoroughly washed. In this process the glucoside is brought into contact with the ferment and completely decomposed, the prussic acid formed being washed away by the water, so that it can be understood readily enough that meal so prepared is innocuous. Large quantities of cassava are also used as a vegetable, being boiled or baked in the same manner as potatoes. Treatment of this kind will destroy the activity of the ferment, but will not necessarily affect the glucoside, so that boiled or baked cassava is in much the same position as hot-pressed linseed cake, *i.e.*, it contains a glucoside capable of yielding prussic acid, but is harmless so long as it is not in contact with a ferment capable of decomposing the glucoside.

Numerous cases of poisoning by cassava are on record, but these seem to have been caused invariably by the consumption of raw cassava. It would seem, therefore, that in the cases of linseed and cassava, the application of enough heat to destroy the activity of the enzyme present renders these materials harmless, and the question arises as to whether similar treatment would not be efficacious in the case of Rangoon beans.

The statement has been made by exporters of Java beans that the latter become safe to use after being boiled in water, and Messrs. Tatlock and Thomson have stated (*loc. cit.*) that when Java beans are steeped in water and afterwards boiled, a considerable proportion of the prussic acid-yielding glucoside is removed. Experiments made at the Imperial Institute with Java beans have shown, however, that practically no change in the quantity of glucoside present is effected by this means, but as the activity of the enzyme is destroyed, the ground boiled beans no longer liberate prussic acid when mixed with water.

There is on record one case which seems to indicate that this treatment of Java beans is insufficient as a precaution against poisoning. Thus Robertson and Wynne state (*Zeit. Anal. Chim.*, 1905, XLIV, 735) that four persons out of seven who had made a meal of *cooked* " Kratok " beans (Kratok is a vernacular name for Java beans in use in Holland and Germany), died, and in each case clear proof of poisoning by prussic acid was obtained.

In view of the large interests concerned in the trade in Rangoon beans, and as, apart from the prussic acid they yield, they appear

to be a useful and nutritious feeding stuff, it seems desirable that the question of their suitability for use as a feeding material should be definitely settled. This is all the more important, as there is reason to believe that the white beans may come into use as a human food, since they closely resemble small haricot beans in appearance.

Until this question has been investigated it is undesirable that any further definite advice should be given to discontinue the use of Rangoon beans, since in spite of the fact that both the red and white varieties have now been shown to yield prussic acid, there is at present no evidence that this is formed in quantity sufficient to be injurious, and although these beans have been used as a feeding stuff now for some years, no poisoning cases have been traced to them so far as is known. At the same time, since the beans yield prussic acid in varying quantity, it is clearly not permissible to recommend them for use as a feeding material. All that can fairly be done at the moment is to place the facts on record.

Irish Seed Potatoes.

The relative value of Irish seed potatoes for planting in Great Britain, as compared with English and Scotch seed, was the subject of some experiments in 1906, an account of which was given in this *Journal*, April, 1907, p. 30. The experiments were regarded as satisfactory, and further trials were arranged by the Irish Department of Agriculture in 1907 at fourteen agricultural colleges and nineteen private farms in England and Wales. All the seed—Irish, Scotch and English—supplied to the experimenters was obtained by the Department through Messrs. Sutton of Reading, in order, as far as possible, to secure seed that would represent fairly the general supply from each of the three countries. The only stipulation made was that the seed in every case should have been grown for at least the two previous years on the same farm. This condition was complied with, and in the case of the Irish seed it may be mentioned that the British Queen seed had been grown on the same farm for three years, and the Up-to-Date seed for about ten years.

The average results from thirty-two centres in England and five centres in Wales were as follows :—

	British Queen.									Up-to-Date.								
	Irish.			Scottish.			English.			Irish.			Scottish.			English.		
	T.	C.	Q.	T.	C.	Q.	T.	C.	Q.	T.	C.	Q.	T.	C.	Q.	T.	C.	Q.
England	9	10	1	9	5	0	8	8	1	11	0	1	11	5	3	6	8	1
Wales ...	8	12	1	8	17	2	7	16	2	11	4	2	9	19	3	6	13	3

These average results show that with the variety British Queen, planted in England, Irish seed has given a slightly higher yield than Scottish seed ; in the Welsh tests, however, the Scottish seed shows a slight advantage. With the variety Up-to-Date the reverse is the case, the Scottish seed giving slightly higher yields in England, whereas the Irish seed has produced heavier crops in Wales. With the exception of the comparison of Irish and Scottish Up-to-Date seed grown in Wales, the average yield from Scottish and Irish seed did not vary by more than 5 cwts. per acre. This is considered to confirm the opinion held by the Department and many other growers to the effect that Irish seed, if not superior, is at least equal to Scottish seed for planting in England and Wales. As regards the comparison with English seed, it is clearly evident that Irish seed will produce much heavier crops, even when the English seed is changed from one district to another, as was necessarily the case in these experiments.

The Department of Agriculture, in reporting* on these trials, observes that these results must, on the whole, be regarded as satisfactory both to farmers in England and in Ireland. The English farmer finds it necessary to obtain a change of seed potatoes at least every second or third year, and these experiments, along with numerous other trials, have proved that he can now look to Ireland as well as to Scotland for seed well suited to his purpose. The Irish farmer has now an opportunity of re-establishing a business which at one time was extensive and profitable.

* Journal of the Irish Department of Agriculture, January, 1908.

The Board have received through the Foreign Office some information as to the conditions of agriculture in the Argentine Republic, which has been supplied by Mr. A. Carnegie Ross, His Majesty's Consul at Buenos Aires.

Agriculture in Argentina.

Live Stock.—It is estimated that the number of live stock in the country is as follows: cattle, 26,000,000; sheep, 77,000,000; horses, 5,500,000; mules and asses, 500,000; pigs, 3,000,000; and goats, 2,500,000. The imports of pedigree stock are very large, but during 1907 the receipts of cattle and sheep were less than in previous years. The figures for the first nine months of the past three years are as follows:—

—	1907.	1906.	1905.
Cattle—			
Shorthorn	1,138	2,025	1,094
Hereford	39	83	56
Jersey	9	10	4
Other breeds	43	124	29
Total	1,229	2,242	1,183
Sheep—			
Lincoln	2,324	3,652	2,430
Rambouillet	62	39	19
Shropshire	112	82	125
Hampshire	31	353	154
Other breeds	131	303	351
Total	2,660	4,429	3,079
Horses—			
Racers...	158	193	120
Clydesdale	114	172	64
Hackneys	29	36	40
Yorkshire	7	9	24
Other breeds	295	343	79
Total	603	753	327
Donkeys	86	194	143
Pigs	750	28	130

There is also a demand for poultry, geese, ducks and turkeys of good strains.

Crops.—Wheat, linseed, maize and oats are the principal crops. The area under wheat in 1907 was 14,782,000 acres, under linseed 3,089,000 acres, and under oats 553,000 acres. This season the weather has been most propitious, and the

wheat and linseed are of excellent quality. It is estimated that the wheat crop will be some 4,000,000 tons and the linseed 800,000 tons. The area planted with maize is probably somewhat less than that planted with wheat, and as this crop is more exposed to attacks of locusts, it is not so popular. As the railways extend the area put under cultivation increases.

The United Kingdom is the market for wheat and maize, Brazil for flour, and Germany for linseed.

Methods of Agriculture.—The system of agriculture is of an unscientific type ; there is no rotation of crops and no manure or fertilisers are used. The ploughing as a rule is very shallow, and is done with ordinary or disc ploughs ; it is no unusual thing to see half-a-dozen horses to a plough going over the ground at a trot. The soil is not worked more than is absolutely necessary to get the seed in. Reapers, binders, headers and strippers are all used in harvesting. The straw is seldom made use of even when cut. The grain is threshed in the field by travelling threshers, and the chaff and straw are burnt. Lately a fair number of Australian and Canadian harvesters have been used, which cut, thresh and bag the grain in one operation. The bagged grain is stored either in the field or at a railway station in piles, resting on boards and more or less covered with tarpaulins. The farmer has no barns nor are there any country elevators. The seasons are somewhat as follows : September-November, sheep shearing ; December-February, wheat, linseed and oat harvest ; and February-April, maize harvest.

The wheats grown are Barletta, Russian, Hungarian, Tusella, French, and a flinty wheat used for macaroni called Candeal.

There is no immediate prospect of any change likely to affect the production or export of agricultural produce, with the exception of the increase and improvement of loading facilities at Bahia Blanca, which will divert some trade from Buenos Aires, and may facilitate the handling of grain. The idea of the advisability of establishing grain elevators is gaining ground.

Composition of the Herbage of Pastures.

In view of the great importance of grazing in Great Britain, and especially in view of the increasing areas which have been laid down to grass during the last thirty years, it is remarkable that so little attention has been given to the composition of the herbage of pastures. With a view to throwing some light on the question an investigation was made by Mr. S. F. Armstrong of Cambridge University Department of Agriculture, into the composition of several types of pasture and meadow land, notably some excellent old pastures in the Market Harborough district of Leicester and Northampton. The method adopted was to measure the relative proportions of surface occupied by the different species, by which means it was considered that a good approximation to the true composition of the herbage could be obtained. A full account of the investigation is given in the *Journal of Agricultural Science* (December 1907). The more important points may be summarised as follows :—

(1) That white clover and rye grass form by far the greater part of the herbage of the best grazing lands—both old and recent in the English Midlands—and that the next most abundant species on these pastures are usually crested dogstail, fiorin (*A. stolonifera*), and rough-stalked meadow grass.

(2) That the herbage of the inferior types of grass land in the same districts consists very largely of bent grass (*A. vulgaris*) and various weeds, while white clover and rye grass are present in comparatively small quantities.

(3) That the only other species of grasses which are occasionally abundant in these pastures are cocksfoot and sheep's fescue in the better fields, Yorkshire fog and tufted hair-grass in the poorer ones.

(4) That the herbage of a pasture varies botanically to a considerable extent during a season, this variation being, however, determined very largely by soil, situation and weather.

(5) That the choicest grazing land is invariably associated with soil rich in available phosphates.

(6) That on soils suitable for permanent pasture, inferiority of the herbage is generally due either to (1) a deficiency of available phosphates, or (2) to their bad mechanical condition.

(7) That herbage of the best grazing land may be twice as rich in nitrogen and phosphate as that of a poor pasture, and that this large difference appears to be directly determined chiefly by the proportion of white clover present and, indirectly by the percentage of available phosphates in the soil.

(8) That from the early part of June onwards the percentage of nitrogen and phosphate in the herbage of a pasture gradually decreases, while the proportion of dry matter rapidly increases.

(9) That the quantity of herbage available per acre for grazing depends much upon the density of the herbage, and that no plants appear to be more capable of producing a dense growth of herbage than white clover and rye grass, providing the soil is suitable for them.

(10) That the number of individual plants per acre on the best old pastures, and necessary for the production of a thick close turf, is probably very much less than is usually supposed.

Importation of certain Meat Foods.

The Local Government Board have under consideration the question of taking action to minimise or to remove the risks to health entailed by the importation of certain meat foods, and they have accordingly published a report by Dr. G. S. Buchanan dealing with (1) imported boneless scrap meat, (2) imported pork, and (3) imported tripe, tongues and kidneys, which are heavily dosed with boron and other preservatives.

Imported Boneless Scrap Meat.—This is meat imported in boxes, barrels or other receptacles and consists of scraps, lumps, trimmings, and other portions of such size and shape that they are not readily identifiable with definite parts of the dressed carcase. Most of it comes in a frozen condition from the United States, but some small quantities are also received from Argentina, Australasia and elsewhere. Inspection in this country can afford no check whatever as to the existence of disease in the animals from which the meat is derived, nor upon the use of uncleanly or objectionable methods of treating or packing, and Dr. Buchanan observes that the unchecked admission of boneless scrap meat into the United Kingdom

appears to constitute a definite risk to health. It also hinders equitable administration of public health laws and regulations relating to unsound or diseased meat in this country, because it is obviously a hardship to the home trader that his meat should be seized by local authorities on account of disease or other conditions which rendered it unwholesome, while similar treatment cannot be applied to imported meat of this type.

At the present time the volume of trade in this commodity is small, and to prohibit its importation would cause little interference with trade. Boneless scrap meat regarded as a portion of our imported meat supply is practically a negligible quantity, and as yet it is only a small portion of the imported meat which finds its way to makers of sausages, minced meat and like articles. If it is urged that this scrap meat is after all for the most part wholesome, the answer is that in that case it is free to come in other forms (*e.g.*, as joints or portions of meat readily identifiable with definite parts of the dressed carcase) which are less open to suspicion.

Tuberculosis and Imported Pork.—This subject was to some extent dealt with in a previous report on the administration in London as regards tuberculosis, which was summarized in this *Journal*, March, 1906, p. 747. The regulations of some foreign countries provide a sufficient safeguard against the importation of tuberculous pork in some cases, but in other cases practices are adopted which not only hinder inspecting authorities from according equal treatment to foreign pork of one or another origin, but have created difficulties in regard to the home trade. Thus at Smithfield, and in other places where the health authority, in accordance with the recommendations of the Royal Commission, 1898, makes it a practice to require surrender of, or to seize, the carcase of any pig showing tuberculous lesions, the home trader has reasonable cause for complaint if at the same time American box pork is allowed to be sold in the same market without hindrance, although it may have been derived from animals which would have been condemned if they had been sent to the market as whole carcasses.

Dr. Buchanan therefore recommends that conditions should be imposed requiring (*a*) pork imported as carcasses to be required to consist of entire carcasses, including the head and

lymphatic glands about the throat, and (*b*) pork imported in portions less than the entire carcase to be enclosed in boxes, barrels, bags, or other receptacles bearing an official mark which has been accepted by the Local Government Board. The Board's acceptance of any proposed mark as an official mark would depend upon the evidence forthcoming from the exporting country that the mark affords a guarantee that the carcasses from which the portions of pork have been derived have been examined by competent and responsible officers and have been found free from tuberculosis in any degree.

Tripe, Tongues and Kidneys heavily Dosed with Preservatives. —As regards these Dr. Buchanan recommends regulation to prevent the introduction from abroad at English ports of tripe (whether cooked or uncooked), tongues and kidneys, which arrive in receptacles containing any preparations consisting of or comprising boric acid, borax or other borates, sulphurous acid or sulphites.

Importation of Live Stock into Brazil.

The Board of Agriculture and Fisheries have now received through the Foreign Office further information supplied by Mr. Arthur Chapman, British Consul-General at Rio de Janeiro, as to the opening afforded for the export of pedigree live stock to Brazil. (See *Journal*, August, 1907, p. 303.) It appears that although the Federal Government have made regulations providing for financial assistance to agriculturists for the purchase of breeding stock, many difficulties are likely to arise in an attempt to establish business on a satisfactory footing.

In the first place, Mr. Chapman considers that direct trade with Brazil is inadvisable, and the only course for those who have no local representatives is to employ commission agents who know the market and the commercial status of the firms and individuals with whom they are dealing. A knowledge of the Portuguese language, as well as of local business methods and conditions of credit, is indispensable. None of the British commission firms in Rio de Janeiro has had much experience in cattle dealing, but some of them are acquainted with the conditions prevailing in the interior. There might be an opportunity for a man experienced in dealing with live stock

to attach himself to such a commission firm who could advise him in local matters. The care of the cattle when they arrived and their transport would have to be considered, while charges on the railways are high and accommodation is bad.

At the present time the States Governments are buying cattle, but it remains to be seen whether they will be successful or whether difficulties will arise in the treatment of the cattle. Mr. Chapman is informed that the climatic conditions are not trying to live stock, with the exception of some fever zones. What is more likely to be prejudicial is the different pasture and the absence of roots. The pastures in the States of Rio Grande do Sul, Sao Paulo, Paraná and Minas Geraes are, speaking generally, good. The last named has excellent grazing ground for cattle and sheep on the west of Minas Railway above the town of S. Joao d'El Rey. The grass is said to equal that of Australia, and is not subject to drought owing to the heavy dew and the large quantities of water in the neighbourhood. The town of Juiz de Fora on the Central of Brazil Railway is the principal agricultural centre of Minas Geraes, and owing to the establishment of a cattle market in the vicinity, more care has lately been taken with the pastures. Dairy farming is a considerable industry.

The State of Sao Paulo is generally supposed to be more in favour of British stock than is Minas Geraes, but it is possible that successful experiments would overcome the prejudice of the latter. The importation of sheep would be likely to be profitable, if it was found that they became acclimatized, as Brazilian mutton is poor and there is little wool.

Something is being done to promote agriculture in Brazil; model farms have been started, and an immigration scheme developed, but whether the energy displayed will last or not, depends partly on the success of the experiments, as the backward state of the industry, the cost of living, and the lack of markets for produce (due to heavy freights and taxation) will not allow of repeated failure. Government representatives have been buying in India and the cattle are reported as arriving in good condition.

The names of certain commission firms and some further information on the subject can be obtained by those interested on application at the offices of the Board.

In this connection it may be mentioned that it is stated in the United States Consular Report (No. 3075) that there are many indications that the State of Minas Geraes is determined upon a course of expansion in agriculture. The administration has begun a systematic campaign for the introduction of modern farming implements, and as an experiment has recently ordered 150 disc ploughs from an American manufacturer, and also 20 farm wagons. These are to be furnished to colonists or established farmers on easy terms in the hope of awakening a widespread interest in up-to-date methods of agriculture. This State has also arranged for an exhibiton of domestic animals, and offers free transportation from all parts of the State, with free forage during the exhibition.

Milk Tests and Records.

The frequency with which the milk of cows should be tested in order to obtain an accurate indication of the average richness of the milk is a matter of considerable importance to any dairy farmer who makes a practice of keeping dairy records. Particulars of some American experiments on this point were given in an article in this *Journal*, May, 1907, and these may now be supplemented by a comparison of actual with estimated results obtained at the Lancashire County Council Farm (Bulletin No. 5). At this farm the milk of twelve cows was tested daily for a period of ten weeks, and this gave an opportunity of judging of the error which would arise by estimating the fat content of the milk at intervals of one, two, three and four weeks. The tests for the percentage of fat in the milk showed that the estimated results for the whole twelve cows taken together agreed very closely with the average actual results obtained by testing daily, as the errors in the case of individual cows compensated one another. The errors in the individual results, on the other hand, were in some cases considerable. With samples taken at intervals of seven days the error in six cases was 3 per cent., in two cases 5 per cent., and in one case it was 11½ per cent. In three cases the sample gave a correct result. The position was much the same when the test was taken fortnightly, but when it was taken at intervals of three weeks or a month, the errors

became much greater and ran up to over 20 per cent. It appears from this that for the purpose of estimating the percentage of fat in the milk of individual cows it is not advisable to take the tests less frequently than on one day in each fortnight, and even then the estimated result can only be regarded as approximate.

The milk-yielding capacity of a cow can be estimated with approximate accuracy by weighing the milk for one day a week or one day a fortnight, and multiplying the result by seven or fourteen. The maximum error which occurred in estimating the milk of twelve cows at the Lancashire County Council Farm from the weight on one day a week or one day a fortnight did not exceed 3 per cent. in any one case. If taken at greater intervals than this the error in some cases rapidly increased and occasionally amounted to from 10 to 19 per cent.

Creamery Systems of Payment.

Where farmers supply milk or cream to a butter factory or creamery, the common practice is to pay for the milk or cream according to the percentage of butter-fat which it contains. In New South Wales a slightly different system has been adopted, viz., that of paying in proportion to the estimated production of butter, and the Department of Agriculture has issued a "cream chart," prepared by Mr. M. A. O'Callaghan, showing the amount of commercial butter obtainable from any given quantity of cream, testing between 20 and 60 per cent. of butter-fat; for example, 100 lb. of cream containing 20 per cent. of butter-fat is estimated to yield 23·30 lb. of butter; the same quantity of cream with 40 per cent. butter-fat will yield 48·30 lb., and the chart gives the calculated result for all quantities at the different percentages. The chart appears to have been largely used for some time, and its practical accuracy under normal conditions seems to be admitted. In one co-operative factory on a total of 33,941 lb. of butter the difference between the actual out-turn and the estimated yield by the chart was only ·17 per cent. In another case the result given by the chart was 24,958 lb., while the amount obtained was 24,963 lb.

Mr. O'Callaghan claims on behalf of this system that the farmer does not sell his cream to a co-operative factory, but

merely consigns it in order that it may be made into butter on his behalf, and that he should therefore be paid at the prevailing price for the butter produced. In addition it is considered that this system enables the farmer to check his receipts by the current price of butter, while the working of the factory is kept up to a certain standard. The tables make a certain allowance for "over-run," and if the management is sound and the machinery satisfactory this allowance will leave a small balance to the factory. This balance should be divided among the farmers in proportion to the amount of butter-fat supplied by each.

Plant Import Regulations.—Transvaal.*

The Agent-General for the Transvaa lhas been informed by his Government that considerable delay frequently arises in regard to the delivery of plants, &c., exported to the Transvaal owing to the failure of the persons concerned to comply with the regulations governing their introduction into the colony, and especially to their neglect to obtain a special permit from the Agricultural Department of the Transvaal.

The following is a summary of the regulations referred to, which are framed under Section I of Ordinance 16 of 1904 for preventing the introduction and spread of insect pests and plant diseases from places beyond South Africa into the Transvaal :—

No plants may be introduced except by post or through Beira, Lourenço Marques, Durban, East London, Port Elizabeth, Mossel Bay and Cape Town. No live insect is to be introduced except by special permission.

The introduction of the following is prohibited :—

(*a*) Any eucalyptus, acacia, or coniferous plant, or portion thereof, except the seed.

(*b*) Any coffee plant, or any portion thereof, with the exception of seed free from pulp.

(*c*) Any stone fruit tree, or any living portion thereof, which

---

* Previous notes as to plant import regulations have appeared in this *Journal* as ollows :—Germany, September, 1903 ; New Zealand, August, 1904, and June, 19c6 ; Natal, November, 1906 ; Western Australia, June, 1906 ; Rhodesia, October, 1906 ; and Cape Colony, Argentina, July, 1907.

was grown or produced in any part of North America or any other country in which peach yellows or peach rosette exists.

(*d*) Any peach stones and peach stocks.

(*e*) Any stocks, excepting apple stocks grown upon Northern Spy roots or other roots which are accepted by the Commissioner of Lands as being resistant to the attack of woolly aphis (*Schizoneura lanigera*), and pear, plum, apricot, cherry, mango, rose and persimmon stocks, which may be imported in bulk.

(*f*) Timber with the bark on, except scaffolding poles from the Baltic Sea or from Canada, and except piles of the turpentine tree (*Syncarpia laurifolia*).

The following plants, or any portion thereof (other than seed or fruit of the same), may not be introduced, except under such precautionary measures as may be deemed necessary: (*a*) Grape vines, or other plants of the family *Vitaceæ*; (*b*) sugar cane; and (*c*) plants cultivated for the production of rubber.

No plant, other than those mentioned in the preceding regulations, may be introduced unless a special permit authorising any such introduction has been obtained from the Minister of Agriculture. Not more than 10 plants or 100 cuttings of any one variety may be introduced under one permit. Permits authorising the introduction of more than 100 plants or 1,000 cuttings are not to be issued to any one person in any year.

All plants and portions thereof are to be examined by an inspector, and all trees and woody plants are to be fumigated. Provision is made for the treatment of diseased plants, &c.

Notes on Insect, Fungus and Other Pests.*

Pear Blister Mite (*Phytoptus pyri*).—There is not much danger of future infection from any mites which may fall with dead leaves. The mites are very small and have limited powers of movement and even if they survived would be unlikely to get back to the trees. The winter is usually passed in the buds. Handpicking the leaves that are attacked may be practised in the summer, and

---

* Notes on insect, fungus and other pests, dealing with the specimens submitted to the Board for identification, and their apparent prevalence, will appear in this *Journal* month by month. The notes commenced with the issue for June, 1907.

the trees should also be sprayed in spring with paraffin emulsion and liver of sulphur. Much good may be done by spraying in winter with paraffin emulsion, care being taken that the buds are reached with the spray.

Beech coccus (Leaflet No. 140) has been reported from Tunbridge Wells and Cirencester, and the Wood Leopard Moth (*Zeuzera aesculi*) from Tiptree, Essex (see Leaflet No. 60).

Fungi.—Rose mildew, which has been reported from Burnley, is caused by the fungus *Sphaerotheca pannosa*, Lév. (See *Journal*, September, 1907, p. 357.) The bushes should be sprayed with a solution of one part pure sulphuric acid in 1,000 of water or 1 lb. to 100 gallons. If the foliage is very young and soft, double the quantity of water should be used.

Specimens of diseased potatoes received from Hounslow showed a dark ring on the potato being cut, which spoiled them for cooking purposes. This was found to be due to the presence of fungus mycelium in the elements of the vascular ring of the tubers. Such diseased tubers should never be used as "seed," but might be boiled and fed to pigs or poultry.

Diseased Hawthorn Hedge.—A case was reported where a considerable length of hedge was destroyed by the lichen, *Evernia prunastri*, L. This lichen can be eradicated by spraying with Bordeaux mixture. The work can be done most effectually before the leaves appear in the spring. Dusting with dry quick-lime before the foliage has expanded will also destroy the lichen, but it is not so effective as Bordeaux mixture.

Other specimens included black currant bushes affected with coral spot disease (Leaflet No. 115), from Ilminster (Somerset), and apple twigs from Swanage showing minute red specks, the fruit of *Nectria ditissima*, Pul., the fungus causing apple tree canker (see Leaflet No. 56).

Relation between the Weather and the Flowering of Fruit-Trees.

In a paper read before the Royal Statistical Society in January, 1907, Mr. R. H. Hooker drew attention to the correlation of the weather and the crops, and pointed out that an examination of the meteorological statistics and of the returns of the produce of crops suggested that the yield was influenced not merely by the character of the weather during the later stages of growth,

but also during seed time. Some similar conclusions in regard to the flowering of fruit trees have been arrived at by Mr. E. P. Sandsten, of the Wisconsin Agricultural Experiment Station (Bulletin No. 137). He points out that the time of flowering in the spring of a given variety of fruit is dependent upon a number of causes or conditions, chief among them being, first, the number of positive temperature units received in the spring preparatory to flowering; second, the stage of development of the flower-buds as dependent upon the climatic conditions of the summer and autumn preceding the flowering; third, the fruiting of the trees, whether light or heavy, the year previous to flowering; fourth, soil conditions and the amount of plant food present in the soil; and fifth, the individual characteristics and state of health of the tree or plant.

From the data given in the Bulletin, it would appear that there is but little relationship between the time of flowering and the temperature in the spring up to the time of flowering, while there appears to be considerable evidence that the temperature and other climatic conditions during summer and autumn preceding flowering have much to do with the time of flowering.

Manuring of Forest Trees.

The manuring of forest trees has been the subject of experiment at the Prussian Forest Experiment Station at Eberswalde, and elsewhere in Germany during the past few years, and in the *Mitteilungen der Deutschen Land.-Gesell.* (16th March, 1907) Dr. Schwappach gives some account of the various methods of manuring which have been tried. From the experiments he concludes that the employment of nitrate of soda is of no value in nurseries of conifers on the sandy soils of Germany, as it gets washed away before the young plants are in a position to make use of it. These soils, moreover, contain so much potash that the application of kainit is also superfluous, while the phosphoric acid they contain is also sufficient for pines. A decidedly favourable result was, however, obtained from nitrogen in a slowly acting form, such as is provided by the cultivation of lupins. The growth of the lupin is much stimulated by the use of kainit and basic slag. The lupins are not now ploughed in, but allowed to die down.

Generally nitrogenous manures alone have proved effective and then only when given in a form in which they acted slowly but continuously. Among the means of providing nitrogen, other than the cultivation of lupins or some leguminous plant, may be mentioned the use of peat placed in holes between the plants and the employment of the pine-dust and forest litter in some similar way so as to bring it within reach of the roots of the young plants.

Manuring with basic slag and sulphate of ammonia has been found effective as means of stimulating pines under 30 years, and the mechanical cultivation of the soil, combined with the application of lime is advantageous.

The Swedish Society for Moor Cultivation.*

The question of utilising and reclaiming the moor and bog lands, which form so considerable a part of the soil of Sweden, has received much attention during the past twenty years. In 1884, M. de Feilitzen, the Director of the Chemical Laboratory at Jönköping, visited Denmark, Holland, and Germany on behalf of the Swedish Academy of Agriculture, in order to study the methods adopted in those countries, and conceived the idea of forming an association for the purpose of encouraging the reclamation of bog land. The Swedish Moor Cultivation Society (*Schwedischer Moorkultur Verein*) was accordingly formed in 1886 with 178 members, a number which rapidly increased until at the present time it reaches 3,400. The subscription is 4*s*. 6*d*. per annum, and all the members receive a bulletin, which is published every two months, dealing with the work of the Society and also of similar Societies abroad. The annual receipts amount to about £2,800, as, in addition to the subscriptions, the Society receives a grant of £830 from the State, £250 from the Provincial Government and £670 from the Chamber of Agriculture. It has chemical and botanical laboratories at Jönköping, with an experimental garden, a library and a museum. At Flahult, some seven miles distant, the Society has an experimental farm of 300 acres where field experiments are carried out.

---

* See also "The Utilisation of Peat land on the Continent," *Journal*, June, 1907, vol. xiv, p. 146.

Analyses of peat soils are made for members in the chemical laboratory at a charge of 3*s.* 6*d.* each, and advice is given as to the best method of cultivation, manuring, &c. The Society also retains the services of a botanist who makes a special study of the botanical questions connected with peat land. Each summer he visits and reports on the character of the peat and bog in a different district, and advises as to the methods of reclamation which he considers applicable. He also examines samples and advises members as to their suitability for fuel or litter.

Experimental cultivation is carried out on a large scale at Flahult, where the work is seen and examined by numerous visitors. The Society also encourages the formation of experimental fields on farms in different districts, by supplying seeds and manure gratuitously. Demonstration plots have also been established with a view to educating the rural population. Practical advice and assistance in dealing with peat land can be obtained from an expert attached to the Society, at a small charge per day for maintenance, and this is a privilege which is much sought after. Some additional information as to this Society, with photographs of the station at Flahult, will be found in the *Journal d'Agriculture Pratique* (21st November, 1907).

Grants for Agricultural Education.

The grants made by the Board of Agriculture in aid of Agricultural Education amounted to £11,550 in the year ending 31st March, 1907, an increase of £1,000 over the previous year. This increase was chiefly caused by the subsidy of £800, given for the first time to the Royal Veterinary College, though small additional grants were made to a few other institutions. In all, 20 colleges and schools now share in the funds placed at the Board's disposal by Parliament, and the number of students receiving instruction at these various centres in 1906–7 was 1,221. While these figures are satisfactory, Mr. Middleton remarks, in the course of his report on this side of the Board's work, that the number of students pursuing the longer courses offered at the colleges is not so large as a few years ago promised to be the case. In spite of inducements in the form of scholarships given

by county councils, and of the improvement in the quality of the instruction offered, the English farmer does not show much anxiety to obtain systematic instruction in agriculture for his son. It is true that there has been of late years a gratifying change in the attitude of the farmer towards the teaching staff of agricultural institutions, but this attitude has not yet reached the point at which it affects the farmer's personal desire for education. Many farmers are now ready enough to admit, by their action on education committees, if not in so many words, that education is a good thing for their neighbours, but the agricultural colleges will not take the place in our system which we wish them to occupy until farmers are convinced that education is a good thing for themselves. In this connection attention is drawn to the case of a student at Armstrong College who holds what may be termed an Estate Scholarship. It is much to be desired that other landowners should follow the example here chronicled when occasion offers, and provide a scholarship to be competed for by the sons of their tenantry. Such practical evidence of a landowner's belief in the value of education would undoubtedly tend to produce a greater appreciation of technical instruction among tenant farmers.

The special grants in aid of agricultural experiments and research amounted to £495, and Mr. Middleton lays emphasis on the importance of these grants, and suggests that much larger sums should be expended by the Board in promoting agricultural research.

The report contains an account of the provision made by the Local Authorities of England and Wales for Agricultural Education. It appears that their expenditure for this purpose out of the residue grant received under the Local Taxation (Customs and Excise) Act during 1906–7 was approximately £80,000. The average sum for the five years 1901–6 was £86,000, which represented 17·6 per cent. of the yearly amount received from the residue grant.

The share of this grant apportioned to agriculture by different counties varies from 59·5 per cent. in East Sussex to 2·2 per cent. in the Holland Division of Lincolnshire, and bears but little relation to the position which agriculture takes in comparison with other industries in the county. Indeed, the share of agricultural education would often seem to be inversely

proportional to the importance of agriculture, and it is in the rich industrial counties where a large population has swelled the county exchequer, and contact with other industries has stimulated the intelligence of the agriculturist, that agricultural education is most liberally aided.

Instruction in Rural Subjects in Elementary Schools.

Instruction in special subjects in public elementary schools is fostered by the system of making special grants, and it appears from the report of the Board of Education for 1906–7 that considerable progress is being made in the teaching of rural subjects, such as gardening, fruit-culture and dairy work.

Gardening.—In the teaching of gardening there has been a great increase; the total number of boys on account of whom grants were paid for instruction in this subject having been 11,216 in 1905–6 as compared with 8,359 in 1904–5 and 5,695 in 1903–4. The increase was almost entirely in the number taking the short course.

The number of schools in county areas which applied for a grant in the subject in 1906–7 was over 900 as compared with 371 earning a grant in 1903–4. In every English county, with the exception of the Soke of Peterborough and Rutland, gardening is taught. The increase is almost entirely confined to those counties in which a horticultural lecturer has been appointed, part of whose duties it is to organize and supervise school gardening, and to train school teachers to teach it. This is the case in Staffordshire and Surrey which have 98 and 79 recognised school gardens respectively. Moreover, it is in the counties, now upwards of twenty, that possess such a horticultural lecturer, that school gardening is, as a rule, best carried out. Evidence continues to be received of the useful effect of gardening on the general work of the school.

Nature Study.—A defect in most of the school gardening was that as it was not dealt with as a branch of nature-study, *i.e.*, as a study of the plant in relation to environment, the opportunity of developing the general intelligence of the scholars in rural work was largely lost. An attempt has been made in certain counties to provide a remedy by issuing

a syllabus of nature-study for the gardening classes. But this is useless if the teachers are not themselves nature students, and it cannot be too strongly insisted that imposing a syllabus in such cases may lead to the worst form of text-book teaching. Twenty-one counties already make some provision for affording the teachers a training in nature-study, but much remains to be done. A number of Saturday classes and summer courses in nature-study and gardening have been recognized.

One of the most encouraging features in the school nature-study movement is the increase in the number of school exhibitions of nature-study and rural economy at agricultural shows and local flower shows. The exhibits have in many cases been of a very high order of merit. To the children, such exhibitions provide a stimulus, to the teachers they provide fresh ideas for work in their own schools, to the general agricultural public they demonstrate that the children's studies have a very real bearing on their future work in life.

Fruit Culture.—Of other rural subjects increased attention is being paid to fruit culture as a part of school gardening, thus carrying out the recommendation of the Departmental Committee on the Fruit Industry in Great Britain. The Committee also advocated the teaching of gardening in training colleges. Bee-keeping is also sometimes associated with gardening or recognised as a subject of nature-study. From time to time the Board of Education are asked to recognize, as attendance at school, manual work affording a direct training for rural life. Sympathetic consideration has been given to these cases, but local circumstances have up to the present prevented the work being started. During this year, however, the Board provisionally sanctioned instruction in thatching and the work was carried out. The Board's inspectors reported favourably upon its educational value, as taught in this case, as a form of manual instruction, but it is understood that the considerable expense of providing such instruction will prevent the experiment from being repeated.

Dairy Work.—Dairying has been re-introduced into the Code as a special grant-earning subject. It was felt that as a manual subject for girls it was one that taught nicety and precision, as an observational subject it was one that developed intelligence in an important branch of domestic work, and that it had the

additional advantage that it is a practical means of giving a knowledge of the principles of hygiene. It was stated that, in a western county, a course of dairying to elementary school girls had led them to seek further instruction in the subject after leaving school, thus having the effect of arousing that desire for further education which all elementary education should produce.

It is not easy to provide for instruction in rural subjects in small village schools, and the Board have had under consideration proposals for establishing upper classes in centrally situated schools where special subjects could be taught, especially schools possessing an endowment which it was thought might be utilised to defray the special expenditure involved.

Suggestions on Rural Education.

With the object of assisting in some degree the adaptation of rural education to the conditions of rural life, specimen courses of special object lessons and of gardening were published by the Board of Education in 1901 and 1902. These pamphlets have long been out of print, and the Board of Education have now issued a pamphlet by Mr. T. S. Dymond, entitled "Suggestions on Rural Education," in which an attempt is made to set out the educational needs of those who are to follow rural pursuits, to suggest the character of the instruction that would supply the educational equipment required to meet those needs, and to indicate the means by which in course of time such instruction could more generally and more adequately be supplied.

Rural prosperity, Mr. Dymond observes, primarily depends on the prosperity of rural industry, and this, though principally determined by economic conditions, must also depend upon the intelligence, adaptability, knowledge and skill of those engaged in it. The prosperity also of rural workers depends on the profitable use made of cottage gardens, allotments and small holdings by the men, and the domestic skill of the women. It must also be remembered that, in the country, people must depend for recreation on their own mental and physical resources, so that general culture has an important part to play in making country life attractive; and lastly, that the

natural increase in the population usually necessitates a steady migration of young men and women from the country to the town, and education must be of such a kind as not to place these at a disadvantage.

Elementary Schools.—It is principally to the development of intelligence and observation in connection with rural subjects that the system of elementary education should be directed. The influence of country surroundings should be distinctly felt, and the subjects should be taught more in relation to the rural environment of the school. Mr. Dymond lays great stress on the value of nature study, gardening and other manual work in elementary schools, as well as the treatment of other subjects, such as drawing, geography, arithmetic, &c., in relation to rural life.

Higher Elementary Schools.—Higher elementary schools and upper classes are intended to carry on the work of the elementary school and develop it in the direction of the industries the scholars are likely to follow. For this purpose, Mr. Dymond suggests that nature-study should give place to the study of natural science and to the application of science to agriculture, horticulture, dairying, domestic economy and hygiene. The subjects of manual instruction should be developed in their industrial aspects: thus fruit culture would form an important subject for practical work, and needlework would be carried on to dress-making. Arithmetic should be developed in the direction of mensuration and mechanics, and be correlated with book-keeping and commercial correspondence. The subjects of general culture would include a secondary course of English literature, history and geography, together with singing and physical exercises.

Rural Secondary Schools.—The function of the rural secondary school is to instil that general culture which gives an outlook wide enough to encompass all rural activity and that knowledge of science underlying rural economy which is necessary rationally to direct rural enterprise. While the elementary schools are essentially intended to prepare pupils for occupations involving manual work, it is the development of mental activities at which the secondary school will predominantly aim. Manual work, therefore, takes a subordinate place in the secondary school, and is introduced rather to

afford a balance in educating powers of mind and body and to provide means for illustrating mathematics and the sciences.

In the elementary school a foundation of nature-study will have been laid upon which the study of science can be built. In the rural secondary school, it is suggested that chemistry and physics should be dealt with as branches of natural science—that is to say, a knowledge of experimental science should be built up by a progressive practical study of air, of water, of mineral substances, of the products of animal and vegetable life, those reactions and substances being used a knowledge of which is important in rural industry.

Mathematics should be correlated with (*a*) practical surveying in the field, (*b*) woodwork from scale drawings, which might be chiefly devoted to making the apparatus and appliances required in the science work indoors and out, and (*c*) mechanics, which should be illustrated by reference to the construction of farm implements and buildings. Book-keeping and correspondence would advantageously deal with the ingoings and outgoings of the experimental field, the orders for manures, tools, seeds and sale of produce. Geography, history, literature, a foreign language and drill will complete the curriculum. Such a course should be graded to the capacity of boys of 12 to 15 or 16 years old, for at 15 or at latest 16 the boys who are to follow rural pursuits will usually begin business life.

Higher Agricultural Education.—The boy who shows such ability as to give promise of a successful career in agricultural science may wisely also leave the secondary school at 16. The next two years may profitably be spent as pupil upon a farm, provided that each winter the pupil attends an agricultural short course, and it is after this that he will enter the agricultural college or university department with the greatest profit. Or again, in lieu of the two years' pupilage on a farm, a year or two years may be spent at a school or schools of rural industry. No county can be held to have a properly organised scheme of agricultural education which does not provide scholarships to enable promising boys with an agricultural bent to mount the educational ladder from the rural elementary school to the agricultural department of a university.

Enlargement of the Journal.

The Fifteenth Volume of the *Journal of the Board of Agriculture* begins with the issue for April next, and arrangements have been made for the introduction of several new features. The size of the *Journal* will be increased from 64 pages to 80 pages each month, and this additional space will be filled, amongst other matter, with a monthly article on the course of trade in agricultural produce, and a comment on the tables of prices that are printed at the end of each number. An attempt will also be made to print from time to time reports on the condition of fruit crops abroad, especially on the Continent, and on the trade in those articles which compete with home-grown produce.

In the April number two series of articles will be begun, the first on weeds, fungi, and agricultural pests, illustrated each month with a coloured plate, the other, on the agriculture of small holdings, showing what methods have been adopted by those who have been successful, with suggestions for those who are about to take up new holdings. It is hoped that these articles will prove of service to all classes of agriculturists.

No change will be made in the present price of the *Journal.*

Circular under the Small Holdings Act.

The Board of Agriculture and Fisheries have addressed the following circular letter, dated 4th February, 1908, to Parish Councils and Chairmen of Parish Meetings in England and Wales :—

SIR,

I am directed by the Board of Agriculture and Fisheries to call your attention to the Small Holdings and Allotments Act, 1907, which came into operation on 1st January, 1908. The Act makes considerable alterations in the law relating to allotments, and the Board think, therefore, that it is desirable that they should summarise the powers and duties of your Council under that Act, and the previous legislation on the subject.

If a Parish Council are of opinion that there is a demand for allotments for the labouring population in their parish, which cannot reasonably be satisfied by voluntary arrangement between the local landowners and the applicants, it is their duty to take the necessary steps to provide the allotments needed, without waiting for any specific representation from ratepayers or electors.

The Allotments Acts empower Parish Councils to purchase or hire land for allotments either within or without their parish, and, if suitable land cannot be acquired by agreement, they may represent the case to the County Council, who may exercise

powers of compulsory acquisition on behalf of the Parish Council. Any land so acquired by a County Council will be handed over to the Parish Council, who must pay all the expenses incurred by the County Council in the matter.

The price or rent to be paid by the Parish Council must not exceed such an amount as will, in the opinion of the Council, permit of all expenses being recouped out of the rents to be obtained from the allotments. The rents to be charged for the allotments must be such as may reasonably be expected to secure the Council against loss.

Parish Councils may improve and adapt any land acquired by them for allotments by draining, fencing, &c., and may erect thereon cottages and buildings or may make adaptations of existing buildings, but not more than one cottage may be erected for occupation with any one allotment, and no cottage may be erected for occupation with any allotment of less than one acre.

Parish Councils can borrow money for the acquisition or adaptation of land for allotments under and in accordance with the provisions of the Local Government Act, 1894. No expense or liability involving a loan may be incurred without the consent of the Parish Meeting and the County Council, and a Parish Council must obtain the consent of the County Council and the Local Government Board before they proceed to raise a loan. Money may be borrowed under the Local Government Act, 1894, to be repaid within such time not exceeding 60 years as the Parish Council, with the sanction of the Local Government Board, may determine, but the Public Works Loan Commissioners, who are authorised to lend money to Parish Councils for the acquisition, improvement or adaptation of land for allotments, can only do so for a period not exceeding 50 years. Parish Councils may raise a loan in the open market, but probably they will be able to get the money on better terms if they borrow from the Public Works Loan Commissioners, or from the County Council, who are empowered to lend to a Parish Council any money which the Parish Council are authorised to borrow. By section 11 of the Local Government Act, 1894, Parish Councils are not permitted to raise for general expenses a sum exceeding the amount of a rate of 3*d.* in the pound without the consent of the Parish Meeting, or of 6*d.* in the pound if such consent is obtained, and the general expenses to which these limits apply include the amount of any annual charge, whether of principal or interest, in respect of any loan. Any money borrowed by a Parish Council for the acquisition, improvement or adaptation of land for allotments is not, however, to be reckoned as part of the debt of the parish for the purpose of the limitation on borrowing under section 12 of the Local Government Act, 1894, which restricts the total outstanding loans of a Parish Council to one-half of the assessable value of the parish.

A Parish Council may let any land acquired by them for allotments to persons belonging to the labouring population resident in the parish, but no person may hold any allotment or allotments acquired under the Acts exceeding five acres in extent, except in special cases with the consent of the County Council.

A Parish Council may let land for allotments to persons working on a co-operative system or, with the consent of the Board, to an association formed for the purpose of creating or promoting the creation of allotments, and so constituted that the division of profits among the members of the association is prohibited or restricted.

Parish Councils may make regulations, subject to the confirmation of the Board, with respect to the letting of allotments under the Acts, and the Board have, therefore, drawn up draft model regulations for the purpose, two copies of which are enclosed.* If your Council have not already done so, the Board suggest that they should consider the advisability of making regulations relating to the letting of allotments in general accordance with the model regulations, and it will be convenient that any regulations proposed to be made should be submitted to the Board for their provisional sanction, before steps are taken to advertise them in accordance with the provisions of section 184 of the Public Health Act, 1875.

* Not printed.

The Acts require that a register showing particulars of the tenancy, acreage and rent of every allotment, whether let or unlet, shall be kept by the Parish Council, and the register is to be open to inspection by any ratepayer without the payment of a fee.

If a Parish Council are of opinion that the acquisition of land for common pasture is desirable, and that land for this purpose can be obtained at such a price that any outlay on its acquisition will be recouped out of the charges to be paid in respect thereof, they may submit to the County Council a scheme for the provision of such common pasture, and the County Council may authorise the Parish Council to acquire the land in the same manner as if it were being acquired for allotments.

The Acts also give power to a Parish Council to acquire land for the purpose of providing grazing rights to be attached to allotments provided by the Council.

The provisions of the Acts have been extended to allotments of which the management is transferred to Parish Councils under the Local Government Act, 1894, *e.g.*, those set out under Inclosure Acts, and these allotments can be improved, let and managed by the Council in the same manner as allotments acquired under the Allotments Acts.

The powers and duties of Rural District Councils in relation to allotments are transferred to the Parish Councils, and any allotments which may have been provided by Rural District Councils are to be handed over to the Parish Council of the Parish in respect of which they were provided. The date on which the transfer of these allotments will take effect will be fixed by the Local Government Board.

The Board are constituted the central authority under the Acts, except as regards questions of finance, which remain under the jurisdiction of the Local Government Board.

Separate accounts of receipts and expenditure under the Allotments Acts are to be kept by Parish Councils.

In rural parishes where there is no Parish Council the Parish Meeting is substituted for the Parish Council in the construction of the Allotments Acts, and in such parishes the powers given by those Acts to Parish Councils may be exercised through a committee appointed under section 19 (3) of the Local Government Act, 1894. Any land acquired for Allotments in such parishes will be vested in the Chairman of the Parish Meeting and the overseers of the parish.

As regards existing allotments in any such parish have which have been set out under Inclosure Acts or otherwise, attention is drawn to sub-section (1) of section 23 of the new Act under which the Parish Meeting have to appoint persons to take over the management of allotments.

The above summary is not intended to be a complete statement of the law on the subject, but the Board think that it may be of service to your Council in their consideration of the steps to be taken to administer the Allotments Acts in their parish.

The Board think that your Council should undertake some enquiry, either informally through individual members of the Council, or by a Parish Meeting or otherwise, with a view of ascertaining whether there is any unsatisfied demand for allotments in your parish, and they suggest that public notice might be given inviting those who desire to obtain allotments to send an application in writing to you, stating the quantity of land desired. Any applications for land exceeding five acres should be forwarded to the County Council to be dealt with by them under the Small Holdings Acts, but the Parish Council can themselves deal with any application for an allotment not exceeding five acres. There is, however, no statutory duty imposed on Parish Councils to provide holdings over one acre, and if, therefore, the Parish Council, in any particular case do not see their way to deal with an application for a holding between one and five acres, it should be forwarded to the County Council.

On the receipt of any applications for allotments, the Board suggest that your Council should make inquiries from the local landowners with a view of ascertaining whether they would be willing to let land for the purpose direct to the applicants, or if they would prefer to sell or let land for the purpose to the

Parish Council. In the latter event the Council should endeavour to come to terms with the owner of the land as to the price to be paid or the rent to be charged, and, if the Council decide to purchase, they should obtain the consent of the Parish Meeting and apply to the County Council and to the Local Government Board for their sanction to the raising of a loan for the purpose.

It may be necessary for the Board to address further communications to you from time to time with reference to other matters connected with the Acts, but they hope that the foregoing observations will be sufficient to enable your Council to proceed with the discharge of their duties in the matter. The Board will be happy at all times to advise as to the best course to be taken in any particular case in which your Council may desire their assistance. I am, &c.,

T. H. ELLIOTT, *Secretary.*

Conveyance of Dogs by Railway.

The Board of Agriculture and Fisheries have addressed the following circular letter, dated the 18th February, 1908, to Railway Companies in Great Britain on the subject of the Conveyance of Dogs by Railway:—

SIR,

I am directed by the Board of Agriculture and Fisheries to advert to their Circular Letter A. 95/C, dated the 3rd May, 1902, a copy of which is enclosed,* as to the unsatisfactory accommodation alleged to have existed prior to that date in connection with the conveyance of dogs, and I am to say that the Board understand that in the case of several railways, arrangements have been made with a view to meet the complaints on the part of dog owners indicated in that Circular. Further representations have, however, been made since 1902, suggesting that action should be taken by the Board under the Diseases of Animals Act, 1894, in the matter.

The Board think that the circumstances of the case will be fully met if they receive an assurance from each Railway Company that the dog-boxes, which in former times were constructed at the bottom of railway carriages and underneath the passenger compartments, have already been abolished, or will no longer be used for the transit of dogs, so far as the particular Company is concerned.

The Board would be glad to receive such an assurance from your Company, and they wish also to take this opportunity of suggesting the desirability of providing movable cages for dogs in Guards' Vans, and of arranging for the disinfection of such cages, and also of the kennels set apart for dogs at railway stations, as soon after use as possible, with a view to the prevention of the spread of such diseases as mange and distemper. I am, &c.,

T. H. ELLIOTT, *Secretary.*

Suspected Rabies in Northampton.

The Board of Agriculture have received reports from Northampton as to the destruction of two dogs under circumstances which give rise to a strong suspicion that the dogs were suffering from Rabies. The Board have therefore, as a precautionary measure, issued an Order under the Diseases of Animals Acts, prohibiting the movement of dogs out of a district comprising the borough of Northampton and certain parishes surrounding it. The Order also prescribes Regulations for the control and muzzling of dogs within the scheduled district. Persons outside the district who propose to enter any part of it would be well advised in their own interest to refrain from taking any dogs with them, so long as the Order remains in operation.

Copies of the Order can be obtained gratis on application to the Board at 4, Whitehall Place, London, S.W.

---

* *Journal,* June, 1902, Vol. ix, p. 87.

The last week of January (ending 1st February) was not characterised by any unusual weather, except in Scotland W. and England N.W. where the rainfall was "heavy." The temperature was, however, slightly above the average, the thermometer rising to 58° in the Midlands on one day. During the *first* week of February, however, although the warmth was normal the sunshine was usually "abundant," and the rainfall was "light" or "very light" in every district. The rainfall for the year had up to this date shown considerable deficiency. In the six weeks England S.W. had received 2·74 in., the Midlands 1·6 in., and England S.E. 1.45 in., less than the average for the last 25 years. Meanwhile, the number of hours of sunshine recorded had been very high, England S.E. having experienced 104 hours or 31 hours more than usual. During the *second* week the rainfall was again small being "light" in every one of the Eastern districts, except England E. Sunshine was "scanty" in England E. and the Midlands, elsewhere "moderate" temperature was, however, high, the record being "unusual" in every part of the United Kingdom, including the extreme north of Scotland. The condition is best shown by the record of the number of "day degrees" of "accumulated temperature" for the week, by which is meant the combined amount and duration of the excess or defect of temperature above or below 42° F. for the period named, a day degree signifying one degree continued for 24 hours, or any other number of degrees for an inversely proportional number of hours. The table for the week is as follows :—

Notes on the Weather in February.

District.	Accumulated Number of Day Degrees. February 9th to 15th, 1908.			
	Above 42°.	Difference from average. (25 years.)	Below 42°.	Difference from average. (25 years.)
Eastern—				
Scotland E.	13	+ 5	22	− 24
England N.E. ...	24	+ 14	13	− 22
England E.	24	+ 13	14	− 25
Midland Counties ...	16	+ 3	26	− 13
England S.E. ...	16	+ 2	26	− 4
Western—				
Scotland W.	19	+ 10	5	− 29
England N.W. ...	18	+ 7	8	− 22
England S.W. ...	23	+ 6	10	− 14
Ireland N.	19	+ 4	4	− 22
Ireland S.	27	+ 6	3	− 18

The *third* week of February was characterized by unsettled weather, culminating in a storm with violent hail and rain squalls. Temperature was "unusual" everywhere, and except in England S.E., the rainfall was "heavy," the excess being large over the Kingdom generally. Bright sunshine was generally deficient. During the *fourth* week the weather was again changeable and unsettled. Rain was frequent during the greater part of the week, while towards its close there were showers or considerable falls of hail and snow, the latter being heavy in the Northern and North-western districts. Throughout the whole of the Eastern district, however, there is still a deficiency in the fall for the year as compared with the average for the last twenty-five years.

Notes on Crops Abroad.

The World's Rye, Barley, Oats and Maize Crops.—Estimates of the production of these crops in various countries are given in *Dornbusch's List* (19th February and 22nd February), for 1907, and seven previous years. The crop of rye in the past year is put at 183,942,000 qrs. as against 171,064,000 qrs. in 1906, and an average of 188.727,000 qrs. in the five years 1901–05. The crop of barley amounts to 151,357,000 qrs. compared with 152,614,000 qrs. in 1906. The yields in these two years appear to have been much above the average of 1901–05, which only amounted to 134,636,000 qrs. Oats were also a fair crop, the production reaching 387,682,000 qrs. against 376,136,000 qrs. in 1906 and 373,397,000 qrs. in 1901–05. Maize is estimated to yield 389,379,000 qrs. compared with 455,333,000 qrs. and 360,338,000 qrs.

France.—The preliminary estimate of the area sown with the principal crops in France, which has been published by the Ministry of Agriculture (*Journal Officiel*, 9th February), shows a diminution in the wheat area of nearly 100,000 acres, from 15,553,000 acres in January 1907 to 15,456,000 acres in 1908. Oats on the other hand have increased by rather more than the same amount, from 1,812,000 acres in 1907 to 1,914,000 acres in 1906. The average condition of the wheat crop is represented by the figure 73 (100 = very good, 99 to 80 = good, 79 to 60 = fairly good).

French Cider Production of 1907.—The past year has been a remarkably unsuccessful one for apples, and the production of cider is officially given by the Ministry of Agriculture (*Journal Officiel*, 9th February) as 60,261,000 gallons as compared with 477,716,000 gallons in 1906. This is a much lower figure than has been recorded for very many years.

Miscellaneous Notes.

Grasses for Bowling Greens.—A useful grass for lawns in or near large towns is *Poa annua* (Annual Meadow Grass). It is necessary, however, that the lawns should be regularly mown and watered, as *Poa annua* is the first grass to suffer in times of drought. For Bowling Greens a mixture of grass seeds is to be preferred, and the following may be recommended:—Crested Dogstail (*Cynosurus cristatus*) = $\frac{1}{2}$, Wood Meadow Grass (*Poa nemoralis*) = $\frac{1}{4}$, Fine-leaved Sheep's Fescue (*Festuca ovina tenuifolia*) = $\frac{1}{4}$.

Trees for Side Walks.—A correspondent enquires what are the most suitable trees for side walks in a parish near Stockport, Cheshire. It is necessary to be well acquainted with local conditions before it is possible to recommend suitable trees with any confidence, but the following would be likely to succeed:—Cornish Elm, Wheatley's Elm, Norway Maple, Purple Sycamore, *Robinia Pseud-acacia*, *Tilia Euchlora*. For smoky districts, the Plane (*Platanus acerifolia*) is exceptionally fitted, but Stockport is probably too cold and northerly for it to succeed there. Holes eight or nine feet in diameter and two feet deep should be prepared for each tree, while new and good soil should be given if needed. It is certainly advisable to have an open grille round the base of each tree, both for the purpose of watering and for root aeration. All wounds over 1 inch in diameter made by pruning should be coated with coal tar.

Export of Butter from Siberia.—The quantity of butter exported from Siberia in the first nine months of 1907 amounted to 1,015,000 cwts. The number of refrigerating wagons employed was 1,270, and it is reported that except from one district no difficulties in transportation occurred. The railway administration have declined to undertake the erection of refrigerating chambers at the local stations, and in consequence the Congress of butter producers and exporters at Omsk has decided to put them up, and charge a rate of one copeck per pood for their use. (*Land. Beilage der Nachrichten für Handel*, 11*th December*, 1907.)

Apple Juice in Germany.—A factory exists at Mannheim for the manufacture of pure apple juice, which is known by the name of "Pomril." The wholesale price is $3\frac{1}{2}d.$ a bottle of about a pint. The method of manufacture appears to be simple. The apples are forwarded to the factory as soon as possible after picking, and first thoroughly cleaned and washed. From the washing tank they are carried to a machine where the apples are torn into small particles. These are then placed in a hydraulic press. The apple juice when drawn from the press is placed in a large air-tight retort where it is sterilized; it is then allowed to settle for some days, and then filtered so that the juice is absolutely transparent. It is then bottled, a slight amount of carbonic acid gas is added, and after corking, the bottles are again sterilized by heating to 150–158° F. The pure apple juice thus treated contains perhaps $\frac{1}{2}$ per cent. of alcohol, and is said to have the flavour of pure apple cider. (U. S. Consular Reports, No. 3,035 and 3,079.)

Agriculture in the Province of Damascus.—The Board have received through the Foreign Office a report by Mr. Consul G. P. Devey, from which it appears that the methods of cultivation in this district are still very primitive and traditional. There is consequently very little opening for agricultural machinery. A few ploughs of British manufacture have been sold to peasants during the last few years, but there is little demand owing to the ease with which the soil is cultivated. It is estimated that there are 3,000,000 sheep and goats and 200,000 cattle, but at present there are no openings for the import of live stock from the United Kingdom.

International Horse-Jumping Competition at Rome.—The Board of Agriculture have received through the Foreign Office, information that an international horse-jumping competition and steeple-chase will be held at Rome from the 29th April to the 5th May next. The programme includes competitions (1) for officers' chargers ridden by their owners, who must be actually serving in the regular army, and (2) for horses of any age or breed mounted by duly accredited *gentlemen riders*. Applications must be received before the 15th April by the "Associazione Nazionale Italiana per il movimento del Forestieri," 52, Via Colonna, Rome. Particulars as to the rules, entry fees and prizes may be obtained at the offices of the Board of Agriculture and Fisheries, 8, Whitehall Place, S.W., where plans of the course may also be seen. Any horse sent to compete from this country will require to be accompanied on its return to Great Britain by a certificate of a veterinary surgeon to the effect that he examined the animal immediately before it was embarked or whilst it was on board the vessel, as the case may be, and that he found that the animal showed no symptom of glanders.

Foreign Hay and Straw Order.—The Board of Agriculture and Fisheries have made an Order prohibiting the landing of hay or straw as from the 9th of March, 1908, from the following countries:—Argentine Republic, Austria-Hungary (including Bosnia and Herzegovina), Brazil, Belgium, France, Germany, Gibraltar, Greece, Italy, Malta, Montenegro, Morocco, Netherlands, Ottoman Dominions, Paraguay, Portugal, Roumania, Russia, Servia, Spain, Uruguay. The Order does not apply to (*a*) hay or straw which at the time of importation is being used for packing merchandise; or (*b*) manufactured straw not intended for use as fodder or litter for animals; or (*c*) hay or straw which is landed at a Foreign Animals Wharf for the purpose of being there destroyed or otherwise disposed of in accordance with any instructions given by the Board of Agriculture and Fisheries; or (*d*) hay or straw which is authorised to be landed for use otherwise than as fodder or litter for animals by a licence granted by an Inspector of the Board of Agriculture and Fisheries, which licence shall contain such conditions as in the opinion of the Board are necessary to prevent the introduction of disease by the hay or straw; or (*e*) hay or straw placed on board a vessel before the commencement of this Order for consignment to Great Britain.

SELECTED CONTENTS OF PERIODICALS.

Bulletin of the Royal Botanic Gardens, Kew. No. 1, 1908.
The Fruit Fly (*Ceratitis capitata*, Wied.); Australian Grasses.

Journal of the Department of Agriculture, Ireland. January, 1908.
The Warble Fly, *Prof. G H. Carpenter* and *J. W. Steen;* Tests with the New French Potato (*Solanum Commersonii*), *G. H. Pethybridge, Ph.D.;* Irish Seed Potatoes in England.

Journal of Economic Biology. 2. IV.
Some Critical Observations on the European species of the Genus *Chermes*, *E. R. Burdon, M.A., F.L.S.*

Journal of the Royal Society of Arts. 31 January, 1908.
Indian Agriculture, *H. Staveley Lawrence, I.C.S.*

Bulletin Mensuel de l'Office des Renseignements Agricoles. December, 1907.
L'analyse des semences; La conservation des oeufs; Exportation des beurres Sibériens; Exportation des oeufs par le port de Riga; L'industrie fromagère Suisse en 1906 et 1907.

Land- und Forstwirtschaftliche Unterrichts-Zeitung. XXI. 3 and 4.
Entwicklung und Aufgaben der analytischen Chemie, *Prof. Dr. Georg Vortmann;* Bemerkungen zur Methode des Unterrichtes an mittleren landwirtschaftlichen Lehranstalten, *Dr. A. Kulisz;* Wander-Koch- und Haushaltungskurse für die bäuerliche Bevölkerung in Oberösterreich, *Georg Wieninger.*

ADDITIONS TO THE LIBRARY.

[NOTE.—The receipt of *annual* publications of foreign agricultural and other departments, experiment stations and societies is not noted in the monthly list of additions to the Library, but a list of all such publications, which are regularly received, will be given from time to time.]

Austria-Hungary—

VIII. Internationaler landwirtschaftlicher Kongress, Wien, Mai, 1907. 4 vols. (894 + 1800 + 1000 + 1100 pp. (approx.) Vienna, 1907.

Belgium—

De Calnive, P.—Le choix des Graines d'après leur volume. (34 pp.) Brussels: Weissenbruch, 1908.

Denmark—

Lund, S., and Kiærskou, H.—En monografisk Skildring af Havekaalens, Rybsens og Rapsens Kulturformer. 115 pp. Copenhagen: Th. Lind, 1884.

France—

Ternier, L. and Masse, F.—Les Canards sauvages et leur Congénères. (751 pp.) Paris: Firmin-Didot, 1907.

Dechambre, P.—La Vache Laitière. (280 pp.) Paris: Chas. Amat, 1907.

Typaldo-Bassia, A.—Les Warrants agricoles. (144 pp.) Paris: Librairie Générale, 1907. 3 fr.

Fron, M. A.—Analyse et Contrôle des Semences Forestières. (128 pp.) Paris: Berger-Levrault, 1906.

Diffloth, P.—Races Bovines. (426 pp.) Paris: Baillière & Fils, 1908. 5 fr.

Germany—

Güssefeld, Dr. O. E.—Justus von Liebig und Emil Louis Ferdinand Güssefeld. Briefwechsel, 1862–66. (72 pp.) Leipzig: Barth, 1907.

Helbig, Dr. M.—Über Düngung im forstlichen Betriebe. (141 pp.) Neudamm: Neumann, 1906.

Germany—*continued.*

Krüger, Fr. and Rörig, G.—Krankheiten und Beschädigungen der Nutz- und Zierpflanzen des Gartenbaues. (212 pp. + 4 plates). Stuttgart: Ulmer, 1908.

Deutsche Landwirtschafts-Gesellschafts. Arbeiten. Heft 130.—Betriebsverhältnisse der deutschen Landwirtschaft. III. Die Landwirtschaft in der Börde. (205 pp.) Heft 131.—Ländlicher Meliorations- und Bau-Kredit. (231 pp.) Heft 132.—Statik des Obstbaues. (147 pp.) Heft 133.—Betriebsverhältnisse der deutschen Landwirtschaft. IV. (117 pp.) Heft 134.—Fütterungsversuche. (73 pp.) Heft 135.—Hauptprüfung von Kleinmotoren. (45 pp.) Untersuchungen an Luftgasapparaten. (49–74 pp.) Heft 136.—Der Ackerfuchsschwanz (*Alopecurus agrestis*). (20 pp. + 6 plates.) Berlin: Paul Parey, 1907–8.

Great Britain—

Woburn Experimental Fruit Farm.—Eighth Report. (129 + xli. pp.) London: Amalgamated Press, Ltd., 1908. 2*s.* 6*d.* net.

Dyer, Bernard.—Fertilisers and Feeding Stuffs. 5th Edition. (150 pp.) London: Crosby Lockwood, 1908. 1*s.* net.

Brown, Ed ard, F.L.S.—Report on the Poultry Industry in Denmark and Sweden. (112 pp.) London: National Poultry Organisation Society, Ltd., 1908. 1*s.* net.

Fowler, W. W.—The Coleoptera of the British Islands. 5 Vols. (269 + 443 + 399 + 411 + 490 pp.) London: L. Reeve & Co., 1887–91.

Fordham, Montague.—Mother Earth. A Proposal for the Permanent Reconstruction of our Country Life, 2nd Edition. (168 pp.) London: Simpkin, Marshall, 1908. 5s. net.

Ireland—

Royal Commission on Congestion in Ireland.—First Appendix to the Seventh Report.—Minutes of Evidence [Cd. 3839.] (403 pp.) [Cd. 3785]. (341 pp.) Second Appendix.—Statistics of the Number, Valuation, Acreage, and Population of Holdings in Ireland [Cd. 3786]. (401 pp.) London: Wyman. 4s. 3d., 3s. 5d. and 3s. 3d. respectively.

Italy—

Federazione Tosco-Romagnola per la riforma forestale.—Atti del Congresso Forestale Italiano. Maggio-Giugno, 1907. (105 pp.)

Annali di Agricoltura, 1907. N. 253. Atti del Consiglio Zootecnico. (444 pp.) Rome, 1907.

Atti del iii. Congresso Risicolo Internazionale, Pavia, Ottobre, 1906. (330 pp.) Milan, 1907.

South America—

Brazil.—Ministerio da Industria, Viação e Obras Publicas, Relatorio, 1907. 2 Vols. (1,005 pp.) Rio de Janeiro: 1907.

The United States of Brazil. (64 pp.) London: Office of *The Sphere*, 1907. 1s.

Ministerio de Agriculture.—Estudio é Informe de la Comision de Investigatión de las Vacuanas preparadas por el Prof. José Lignières. (518 pp.) Buenos Aires, 1906.

United States—

Davis, C. W.—Rural School Agriculture (267 pp.), 1907; *Various Authors.*—Tobacco Culture (50 pp.), 1884; *Chittenden, F. H.*—Insects Injurious to Vegetables (262 pp.), 1907; *Conn, H. W.*—Practical Dairy Bacteriology (314 pp.), 1907; *Burkett, C. W.*—Soils (303 pp.), 1907. New York: Orange Judd Company.

"Shepherd Boy." Modern Sheep. Breeds and Management. (333 pp.) Chicago: American Sheep Breeder Co., 1907.

[Books may be borrowed from the Board's Library on certain conditions, which may be ascertained on application.]

PRICES OF AGRICULTURAL PRODUCE.

AVERAGE PRICES of LIVE STOCK in ENGLAND and SCOTLAND in the Month of February, 1908.

(*Compiled from Reports received from the Board's Market Reporters.*)

Description.	England. First Quality.	England. Second Quality.	Scotland. First Quality.	Scotland. Second Quality.
FAT STOCK :—	per stone.*	per stone.*	per cwt.†	per cwt.†
Cattle :—	s. d.	s. d.	s. d.	s. d.
Polled Scots	8 0	7 10	37 11	34 8
Herefords	7 10	7 4	—	—
Shorthorns	7 10	7 3	36 9	34 0
Devons	8 0	7 5	—	—
	per lb.*	per lb.*	per lb.*	per lb.*
	d.	d.	d.	d.
Veal Calves	$8\frac{1}{2}$	$7\frac{1}{2}$	$8\frac{1}{2}$	$6\frac{1}{4}$
Sheep :—				
Downs	9	$8\frac{1}{4}$	—	—
Longwools	$8\frac{3}{4}$	8	—	—
Cheviots	$9\frac{1}{2}$	9	$9\frac{1}{4}$	$8\frac{1}{4}$
Blackfaced	$9\frac{1}{4}$	$8\frac{1}{4}$	$8\frac{1}{2}$	$7\frac{1}{2}$
Cross-breds	9	$8\frac{1}{4}$	$9\frac{1}{2}$	$8\frac{1}{2}$
	per stone.*	per stone.*	per stone.*	per stone.*
Pigs :—	s. d.	s. d.	s. d.	s. d.
Bacon Pigs	6 3	5 9	6 4	5 7
Porkers	6 8	6 3	6 8	6 0
LEAN STOCK :—	per head.	per head.	per head.	per head.
Milking Cows :—	£ s.	£ s.	£ s.	£ s.
Shorthorns—In Milk	21 11	18 4	22 6	18 3
,, —Calvers	20 16	18 7	20 17	17 5
Other Breeds—In Milk ..	19 19	16 6	18 19	15 16
,, —Calvers ...	13 10	12 2	18 13	15 16
Calves for Rearing	2 3	1 14	2 14	1 15
Store Cattle :—				
Shorthorns—Yearlings ...	9 16	8 10	10 5	8 0
,, —Two-year-olds ...	14 0	12 15	14 14	12 5
,, —Three-year-olds	16 10	14 19	17 4	14 11
Polled Scots—Two-year-olds	—	—	16 3	13 17
Herefords— ,,	14 10	12 13	—	—
Devons— ,,	14 8	12 19	—	—
Store Sheep :—	s. d.	s. d.	s. d.	s. d.
Hoggs, Hoggets, Tegs, and Lambs—				
Downs or Longwools ...	47 11	42 11	—	—
Scotch Cross-breds... ...	—	—	35 10	30 7
Store Pigs :—				
Under 4 months	22 6	16 8	21 1	16 6

* Estimated carcase weight.

† Live weight.

AVERAGE PRICES of DEAD MEAT at certain MARKETS in ENGLAND and SCOTLAND in the Month of February, 1908.

(Compiled from Reports received from the Board's Market Reporters.)

Description.	Quality.	London.		Birmingham.		Manchester.		Liverpool.		Glasgow.		Edinburgh.	
		per cwt.		per cwt.		per cwt.		per cwt.		per cwt.		per cwt.	
		s.	*d.*	*s.*	*d.*	*s.*	*d.*	*s.*	*d.*	*s.*	*d.*	*s.*	*d.*
BEEF:—													
English	1st	51	6	51	6	51	6	—		57	0*	57	0*
	2nd	50	0	48	0	48	6	—		52	6*	51	6*
Cow and Bull ...	1st	40	0	44	6	43	0	39	0	44	6	44	6
	2nd	35	6	39	6	38	6	34	6	37	6	36	0
U.S.A. and Canadian:—													
Port Killed ...	1st	52	0	50	6	49	0	49	6	52	0	50	6
	2nd	48	6	45	0	46	0	45	0	49	6	42	0
Argentine Frozen—													
Hind Quarters ...	1st	28	0	30	6	28	6	28	0	31	0	32	0
Fore ,, ...	1st	27	0	27	6	26	0	25	6	28	0	29	0
Argentine Chilled—													
Hind Quarters ...	1st	41	6	41	6	40	0	39	0	39	6	41	0
Fore ,, ...	1st	31	0	32	0	30	6	29	0	—		30	6
American Chilled—													
Hind Quarters ...	1st	53	6	54	0	53	0	52	6	54	6	54	6
Fore ,, ...	1st	36	0	37	0	35	0	35	0	38	0	38	0
VEAL:—													
British	1st	70	0	70	0	74	0	79	6	—		—	
	2nd	65	6	58	6	66	0	74	0	—		—	
Foreign	1st	70	6	—		62	0	66	6	—		71	0
MUTTON:—													
Scotch	1st	79	0	72	6	79	6	80	0	75	0	72	6
	2nd	74	0	56	0	74	6	75	0	59	0	57	0
English	1st	73	0	72	6	74	6	73	6	—		—	
	2nd	65	6	56	6	70	0	67	0	—		—	
U.S.A. and Canadian—													
Port killed ...	1st	—		70	0	70	0	70	0	—		—	
Argentine Frozen ...	1st	30	6	30	6	31	0	31	0	29	6	30	6
Australian ,, ...	1st	29	0	29	0	28	0	28	6	30	6	—	
New Zealand ,, ...	1st	40	0	37	6	—		—		—		—	
LAMB:—													
British	1st	121	6	—		—		—		—		—	
	2nd	107	6	—		—		—		—		—	
New Zealand ..	1st	59	6	57	0	56	0	56	0	—		—	
Australian	1st	44	6	49	6	42	0	42	0	45	0	46	8
Argentine	1st	42	0	43	0	40	0	41	0	45	0	42	0
PORK:—													
British	1st	56	0	59	0	60	0	59	0	54	0	52	0
	2nd	49	6	53	6	55	6	53	6	52	0	45	0
Foreign	1st	53	0	48	6	49	0	49	0	—		—	

* Scotch.

AVERAGE PRICES of **British Corn** per Quarter of 8 Imperial Bushels, computed from the Returns received under the Corn Returns Act 1882, in each Week in 1906, 1907 and 1908.

Weeks ended (*in* 1908).	Wheat.			Barley.			Oats.		
	1906.	1907.	1908.	1906.	1907.	1908.	1906.	1907.	1908.
	s. d.	*s. d.*	*s. d.*	*s. d.*	*s. d.*	*s. d.*	*s. d.*	*s. d.*	*s. d.*
Jan. 4 ...	28 4	26 0	35 1	24 6	23 11	26 9	18 2	17 3	18 4
,, 11 ...	28 6	26 1	35 2	24 8	24 2	26 9	18 4	17 4	18 3
,, 18 ...	28 5	26 1	35 5	24 11	24 1	27 1	18 4	17 5	18 5
,, 25 ...	28 7	26 2	35 6	25 1	24 5	26 11	18 7	17 5	18 5
Feb. 1 ...	28 10	26 3	35 0	25 1	24 4	26 11	18 10	17 5	18 4
,, 8 ...	28 10	26 6	34 3	25 3	24 5	26 9	18 10	17 7	18 3
,, 15 ...	28 11	26 7	33 1	25 6	24 1	26 9	19 0	17 7	18 0
,, 22 ...	28 10	26 10	32 6	25 4	24 2	26 5	19 0	17 9	17 11
,, 29 ...	28 8	26 9	30 11	25 0	24 2	26 3	19 0	17 9	17 8
Mar. 7 ...	28 5	26 8	30 5	25 1	23 11	26 1	18 8	17 11	17 8
,, 14 ...	28 5	26 10		24 8	24 2		18 10	18 0	
,, 21 ...	28 4	26 10		24 4	24 0		18 8	18 1	
,, 28 ...	28 3	26 8		24 5	23 9		18 11	18 2	
Apl. 4 ...	28 7	26 9		24 2	24 3		18 11	18 3	
,, 11 ...	28 11	26 8		24 4	23 9		19 4	18 6	
,, 18 ...	29 4	26 8		24 0	23 3		19 1	18 7	
,, 25 ...	29 6	26 10		24 0	23 3		19 6	18 9	
May 2 ...	29 10	27 0		23 10	23 6		19 9	19 3	
,, 9 ...	30 1	27 6		24 1	24 0		20 0	19 7	
,, 16 ...	30 3	28 4		23 10	23 10		20 1	20 1	
,, 23 ...	30 4	29 7		24 2	24 3		20 2	20 5	
,, 30 ...	30 4	31 4		22 10	24 0		20 5	20 8	
June 6 ...	30 3	32 0		23 4	24 7		19 11	20 7	
,, 13 ...	30 4	31 10		23 6	24 7		20 2	20 11	
,, 20 ...	30 5	31 4		22 10	24 11		20 2	20 9	
,, 27 ...	30 3	31 2		24 3	24 6		20 1	20 8	
July 4 ...	30 2	31 3		23 0	24 8		20 2	20 11	
,, 11 ...	30 5	32 0		23 8	24 10		20 4	20 11	
,, 18 ...	30 3	32 6		23 2	24 6		20 5	21 1	
,, 25 ...	30 5	32 11		22 4	27 3		20 2	20 8	
Aug. 1 ...	30 9	33 2		22 1	26 4		19 3	21 2	
,, 8 ...	30 5	33 5		23 0	26 6		17 11	21 3	
,, 15 ...	29 0	33 6		24 2	25 9		17 0	20 4	
,, 22 ...	27 9	33 7		25 0	25 0		16 10	19 8	
,, 29 ...	26 9	33 10		24 3	24 6		16 6	18 11	
Sept. 5 ...	26 4	31 11		24 9	24 2		16 3	17 7	
,, 12 ...	25 11	31 4		24 3	24 4		16 1	17 6	
,, 19 ...	25 9	31 5		24 3	25 0		16 0	17 6	
,, 26 ...	25 9	31 8		24 8	25 3		16 2	17 8	
Oct. 3 ...	26 1	32 6		25 0	25 5		16 3	17 9	
,, 10 ...	26 3	33 3		25 3	25 9		16 7	17 11	
,, 17 ...	26 6	34 4		24 10	26 3		16 8	18 0	
,, 24 ...	26 7	35 9		24 10	27 2		16 10	18 7	
,, 31 ...	26 7	36 3		24 8	27 7		16 11	18 10	
Nov. 7 ...	26 6	35 10		24 8	27 8		17 1	18 10	
,, 14 ...	26 4	35 1		24 4	27 8		17 2	18 8	
,, 21 ...	26 3	34 7		24 1	27 5		17 3	18 9	
,, 28 ...	26 1	34 7		24 1	27 5		17 2	18 7	
Dec. 5 ...	26 1	34 7		24 1	27 1		17 4	18 6	
,, 12 ...	26 1	34 8		23 11	27 0		17 3	18 5	
,, 19 ...	26 3	34 9		24 3	27 1		17 3	18 3	
,, 26 ...	26 0	34 6		24 1	26 10		17 3	18 0	

NOTE.—Returns of purchases by weight or weighed measure are converted to Imperial Bushels at the following rates: Wheat, 60 lbs.; Barley, 50 lbs.; Oats, 39 lbs. per Imperial Bushel.

AVERAGE PRICES of **Wheat, Barley,** and **Oats** per Imperial Quarter in FRANCE, BELGIUM, and GERMANY, and at PARIS, BERLIN, and BRESLAU.

—		Wheat.		Barley.		Oats.	
		1907.	1908.	1907.	1908.	1907.	1908.
		s. d.	*s. d.*	*s. d.*	*s. d.*	*s. d.*	*s. d.*
France:	January ...	39 7	39 5	26 5	26 0	22 11	20 0
	February ...	39 7	39 3	26 7	25 11	22 11	20 3
Paris:	January ...	40 4	39 0	26 7	26 2	23 2	19 4
	February ...	40 2	39 4	26 10	26 2	22 8	19 8
Belgium:	January ...	28 9	34 7	25 0	26 7	19 5	21 5
Germany:	January ...	38 2	46 6	28 7	30 3	22 10	23 3
	February ...	39 0	44 9	28 9	29 6	23 9	22 8
Berlin:	January ...	38 5	47 4	—	—	23 5	23 9
Breslau:	January ...	36 10	46 6	29 0 (brewing) 22 10 (other)	31 3 (brewing) 27 9 (other)	20 10	21 4

NOTE.—The prices of grain in France have been compiled from the official weekly averages published in the *Journal d'Agriculture Pratique*; the Belgian quotations are the official monthly averages published in the *Moniteur Belge*; the German quotations are taken from the *Deutscher Reichsanzeiger*, the prices for the German Empire representing the average of the prices at a number of markets. The mark is now taken as equal to 11·8*d.*, and the German prices for the former year have been recalculated on this basis.

AVERAGE PRICES of **British Wheat, Barley,** and **Oats** at certain Markets during the Month of February, 1907 and 1908.

—	Wheat.		Barley.		Oats.	
	1907.	1908.	1907.	1908.	1907.	1908.
	s. d.	*s. d.*	*s. d.*	*s. d.*	*s. d.*	*s. d.*
London...	27 7	33 10	23 11	26 0	18 4	18 9
Norwich	26 2	33 3	24 7	26 9	16 11	18 1
Peterborough	25 9	31 11	23 1	25 7	16 10	17 4
Lincoln...	26 2	32 2	24 3	26 11	17 1	17 6
Doncaster	25 9	32 4	24 2	26 4	17 5	18 1
Salisbury	26 3	32 7	23 9	25 10	17 6	17 3

AVERAGE PRICES of PROVISIONS, POTATOES, and HAY at certain MARKETS in ENGLAND and SCOTLAND in the Month of February, 1908.

(*Compiled from Reports received from the Board's Market Reporters.*)

Description.	London.		Bristol.		Liverpool.		Glasgow.	
	First Quality.	Second Quality.	First Quality.	Second Quality.	First Quality.	Second Quality.	First Quality.	Second Quality.
	s. *d.*	*s.* *d.*	*s.* *d.*	*s.* *d.*	*s.* *d.*	*s.* *d.*	*s.* *d.*	*s.* *d.*
BUTTER :—	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.
British ...	16 0	14 6	16 0	14 9	—	—	16 3	—
	per cwt.	per cwt.	per cwt.	per cwt.	per cwt.	per cwt.	per cwt.	per cwt.
Irish Creamery	—	—	—	—	—	—	—	—
,, Factory	—	—	—	—	—	—	—	—
Danish ...	140 6	136 6	—	—	144 0	140 6	142 0	—
Russian ...	131 0	127 6	—	—	—	—	134 0	—
Australian ...	139 6	136 6	142 0	139 0	140 6	137 6	141 6	126 0
New Zealand	141 6	138 6	144 0	142 0	142 6	140 6	142 0	—
CHEESE :—								
British—								
Cheddar ...	76 0	72 6	74 0	63 6	74 0	70 0	69 0	63 6
					120 lb.	120 lb.		
Cheshire ...	—	—	—	—	77 0	70 0	—	—
					per cwt.	per cwt.		
Canadian ...	65 0	64 0	64 6	62 0	64 0	62 0	65 0	61 6
BACON :—								
Irish	57 6	53 0	—	—	56 6	51 0	59 6	56 6
Canadian ...	47 0	43 6	48 0	43 6	45 0	43 6	49 0	46 6
HAMS :—								
Cumberland ...	97 0	85 6	—	—	—	—	—	—
Irish	96 0	87 0	—	—	—	—	82 0	74 0
American (long cut) ...	44 6	40 0	45 0	41 6	43 0	39 0	44 6	42 6
EGGS :—	per 120.	per 120.	per 120.	per 120.	per 120.	per 120.	per 120.	per 120.
British ..	12 11	9 2	10 2	—	—	—	—	—
Irish	10 7	9 8	9 10	8 8	10 0	9 4	9 5	8 8
Danish ...	11 4	10 3	—	—	10 1	—	8 8	7 11
POTATOES :—	per ton.	per ton.	per ton.	per ton.	per ton.	per ton.	per ton.	per ton.
Langworthy ...	110 0	100 0	105 0	100 0	105 0	100 0	86 0	80 6
Main Crop ...	108 6	100 0	106 0	100 0	105 0	100 0	—	—
Up-to-Date ...	103 6	91 0	100 0	90 0	81 6	78 6	80 0	72 0
HAY :—								
Clover ...	94 6	83 6	75 0	—	93 6	67 6	77 0	70 0
Meadow ...	78 0	61 0	67 6	—	—	—	55 6	50 6

DISEASES OF ANIMALS ACTS, 1894 to 1903.

NUMBER of OUTBREAKS, and of ANIMALS Attacked or Slaughtered.

GREAT BRITAIN.

(From the Returns of the Board of Agriculture and Fisheries.)

DISEASE.	FEBRUARY.		2 MONTHS ENDED FEBRUARY.	
	1908.	1907.	1908.	1907.
Swine-Fever :—				
Outbreaks	119	176	251	323
Swine Slaughtered as diseased or exposed to infection ...	515	854	1,051	1,461
Anthrax :—				
Outbreaks	121	96	225	167
Animals attacked	159	121	324	212
Foot-and-Mouth Disease :—				
Outbreaks	3	—	3	—
Animals attacked	112	—	112	—
Glanders (including Farcy) :—				
Outbreaks	75	93	144	173
Animals attacked	302	258	497	408
Sheep-Scab :—				
Outbreaks	264	139	478	284

IRELAND.

(From the Returns of the Department of Agriculture and Technical Instruction for Ireland.)

DISEASE.	FEBRUARY.		2 MONTHS ENDED FEBRUARY.	
	1908.	1907.	1908.	1907.
Swine-Fever :—				
Outbreaks	15	17	29	33
Swine Slaughtered as diseased or exposed to infection ...	344	347	651	568
Anthrax :—				
Outbreaks	1	—	2	—
Animals attacked	1	—	2	—
Glanders (including Farcy) :—				
Outbreaks	—	—	—	—
Animals attacked	—	—	—	—
Sheep-Scab :—				
Outbreaks	110	62	190	111

(5,500 3 | 08—H & S 3110)

Supplement

The Journal

OF THE

BOARD OF AGRICULTURE.

VOL. XIV. No. 10. JANUARY, 1908.

REPORT

ON

AGRICULTURAL EDUCATION

IN THE

UNITED STATES.

LONDON
PRINTED FOR HIS MAJESTY'S STATIONERY OFFICE,
By HARRISON & SONS, St. Martin's Lane, London, W.C.
and PUBLISHED by the BOARD OF AGRICULTURE AND FISHERIES.

PRICE FOURPENCE.
POST FREE.

[PRICE TO SUBSCRIBERS TO THE JOURNAL, **THREEPENCE.**]

THIS Report on Agricultural Education in the United States has been drawn up by Mr. Esme Howard, C.V.O., C.M.G., Councillor of the British Embassy at Washington, in response to a request that the Departmental Committee on Agricultural Education might be furnished with information as to the provision made in the United States for affording instruction in Agriculture. In view of the interesting character of the Report, it is thought that it may usefully be issued as a separate publication.

CONTENTS.

REPORT

ON

AGRICULTURAL EDUCATION

IN THE

UNITED STATES.

EDUCATION in the United States is a matter which is left to the Governments of the separate States to arrange as they think proper, but the Federal Congress has from time to time voted permanent appropriations for grants of money to the different States for the support of agricultural and technical educational institutions, which the latter are at liberty to accept, provided they comply with the conditions attaching to such grants. In this way were established the State Agricultural Colleges and Experiment Stations, which have played so great a part in the development of agriculture in this country, and which are destined to play a still greater part in the future. One of their greatest functions is to provide teachers for that agricultural instruction which is now being increasingly introduced into the curriculum of high schools and primary schools in many States of the Union.

There is not, therefore, necessarily any uniformity of education throughout the United States, each State having its own system, but the action of the Federal Education Bureau and of the Federal Department of Agriculture, especially perhaps the latter, tends to unite the efforts made throughout the country for progress and reform in agricultural education. Their action will probably have the effect of evolving in course of time similarity, if not complete uniformity, in the methods of agricultural education adopted by the different States.

Federal Legislation for the Establishment of Agricultural and Industrial Colleges.

The first legislation of any consequence in the United States with regard to Agricultural Education was the Act passed in 1862 for the endowment of agricultural colleges, entitled the first Morrill Act.

It was therein provided that a portion of the public lands in the hands of the Federal Government should be granted to the several States of the Union to the extent of 30,000 acres for each Senator and Representative sent by any particular State to Congress, according to the apportionment based on the census of 1860.* A condition was made that no mineral lands were to be selected or purchased under this Act.

The clauses providing for the acquisition and sale of these lands are interesting but do not concern us here.

Section 4 of the Act declares that its aim is to constitute a perpetual fund for the endowment of at least one college (in each State) "where the leading object shall be, without excluding other scientific and classical studies, and including military tactics, to teach such branches of learning as are related to agriculture and the mechanic arts in such manner as the legislatures of the States may respectively prescribe."

Paragraph 2 of Section 5 lays down that no part of this fund or interest thereon is to be used for the purchase, erection or repair of buildings, which are to be put up and maintained at the expense of the States. An annual report regarding the progress of each college is to be made to the Secretary of the Interior.

The first Act of 1862, mentioned above, limited the time within which any State could take advantage of the privileges granted under it to five years, and at the same time provided that no State while in a condition of rebellion against the Government of the United States could benefit by it.

Owing no doubt to the War of the Secession a number of the Southern States were prevented from taking advantage of it,

---

* The total number of acres of land granted by the United States Government under this Act was 10,233,169, of which 844,164 were still unsold in 1905.

and therefore in 1866 another Act was passed extending the time limit for another three years.

In 1887 an important Act, known as the Hatch Act, was passed for the establishment of agricultural experiment stations.

This Act provides for the establishment of departments, to be known as "Agricultural Experiment Stations," under the direction of the colleges established by virtue of the preceding Act "to aid in acquiring and diffusing among the people of the United States useful and practical information on subjects connected with agriculture, and to promote scientific investigation and experiment respecting the principles and applications of agricultural science."

Section 2 of the Act enumerates various subjects over which the activities of these stations are to extend, which comprise every possible matter of interest to agriculturists.

Section 3 provides for the uniformity of methods and results in the work of the stations by ordering that the Secretary of Agriculture shall furnish forms for the tabulation of results of investigation or experiments; shall indicate from time to time such lines of inquiry as may seem to him most important, and furnish advice and assistance. The experiment stations on their part are to furnish an annual report to the Governor of the State, copies of which are to be sent to the Secretary of Agriculture. Bulletins of progress are also to be issued by them at least once every three months. Under certain conditions the sum of approximately £3,000 sterling per annum is appropriated to each State for the purpose of this Act.

In 1890 the second Morrill Act was passed for the further endowment of agricultural colleges. A further sum of £3,000 per annum was by this Act granted to each State, which sum was to increase by £200 a year for 10 years until it reached the total of £5,000 a year.

It was made a condition, however, that no money was to be paid under this Act to any State for the support of a college where a distinction of race or colour is made, but the establishment of such colleges separately for white or coloured students is held as a compliance with the provisions of the Act provided the funds received by the State are equitably divided between them in accordance with regulations subsequently stated.

Any part of this grant which is proved to be misapplied or

lost by any State is to be made good by such State, and no part of the grant is to be used for the construction or maintenance of buildings.

The usual annual report as to progress and the use made of the grant is to be made to the Secretary of Agriculture.

ADAMS ACT, 1906.—In 1906 the Act, known as the Adams Act, provided for the further endowment of the agricultural experiment stations attached to the colleges.

By this Act £1,000 per annum was appropriated to each State in addition to what had been already voted, and this £1,000 was to be increased annually by £400 until a total of £6,000 per annum had been reached. This grant was to be applied only to the necessary expenses of conducting original researches or experiments bearing directly on the agricultural industry of the United States. Then follow the usual provisions regarding annual reports, misapplication of moneys, &c.

Lastly by the Act approved on the 4th March, 1907, making appropriations for the Department of Agriculture it was decided to add to the grants previously made for the benefit of the agricultural colleges in each State and Territory the further sum of £1,000 per annum for five years, beginning with the fiscal year ending June 30, 1908, and it was provided that after these five years the total grant payable to each of the various States and Territories on behalf of their respective colleges should be £10,000 sterling.

The Act making appropriations for the Department of Agriculture for the fiscal year ending June 30, 1907, places at the disposal of the Secretary of Agriculture the sum of £160,700 ($803,500) on behalf of the agricultural experiment stations established by the Act of 1887. Of this sum the Secretary is authorised to spend £10,600 sterling in establishing and maintaining agricultural stations, including the erection of buildings, in the Territories of Alaska, Hawaii and Porto Rico. Also £1,000 is set apart for investigation and report upon the organisation and progress of farmers' institutes and agricultural schools in the several States and Territories, and upon similar organisations in foreign countries.

The Secretary was also authorised to cause inquiries to be made and reports to be drawn up in the Bureau of Animal Industry on the nutritive value of articles of food with special suggestions

for wholesome foods, less wasteful and more economical than those in use, and on irrigation and drainage in respect to agriculture. Appropriations for the above work carried the total vote for experiment stations up to £194,972 ($974,860).

The sum of £4,000 was also voted for the special purpose of developing the dairy industry of the Southern States by conducting experiments, holding meetings and giving object lessons in co-operation with individual dairymen and State experiment stations. An inquiry was also to be made into the causes of diseases of animals in Minnesota and adjoining States.

The sum of £5,000 was further appropriated for experiments in animal breeding and feeding in co-operation with State agricultural stations.

For the Bureau of Plant Industry, £7,556 sterling ($37,780) was voted for the investigation of fruits, grains, fibres, &c., the propagation and distribution, purchase and testing of rare and valuable seeds, bulbs, trees, &c., with a view to their introduction and cultivation, and for the destruction of the Mexican cotton boll weevil in the Southern States.

Portions of the total sum appropriated were also to go to the Bureau of Chemistry, the Bureau of Entomology and the Office of Public Roads.

Bulletins and reports issued by agricultural colleges and experimental stations, of which there are a large number, are allowed to be sent free by post under certain conditions and restrictions. No such printed matter, however, which is purchased or subscribed for is entitled to free postage. This free postage arrangement holds good not only for the United States of America, but also for Canada, Mexico and Hawaii.

The Department of Agriculture has issued, among others, the following rulings on various questions which have arisen in respect to the interpretation of the Acts establishing agricultural experiment stations :—(1) That owing to the smallness of the sum appropriated to each State there ought not to be more than one station, and that as far as practicable the co-operation of individuals and communities benefited by the stations should be sought ; (2) that the money appropriated is not to go to the purchase of land any more than to the erection of buildings ; (3) that expenses incurred in the management of farms are not

a proper charge against the Congress appropriations ; (4) that moneys received by experimental stations for the sale of farm products, &c., rightfully belong to such stations, provided that no expenses connected with such sales be charged against the Congress appropriations ; (5) that the expenses incurred by an experiment station should not exceed the grant voted by Congress ; and (6) that stations have no power to borrow money to be repaid out of the appropriation of Congress.

Statistics of Land-Grant Colleges in 1905.

There were in 1905 educational institutions established according to the Acts of Congress of July 2, 1862, and August 30, 1890, in all the States and Territories, except Alaska, Hawaii and Porto Rico. The total number of these is 65, of which 63 maintain courses in agriculture ; 48 of the latter are for whites and 15 for negroes and Indians. The aggregate value of the permanent funds and equipment of the land-grant colleges and institutions was estimated for 1905 at about £16,250,353 sterling ($81,251,764). Their income, exclusive of the grant for experiment stations, amounted to a total of £2,353,431 ($11,767,154), of which £144,298 ($721,491) represented the interest on the land-grant under the Act of 1862, £19,392 ($96,960) interest on other land-grants, £240,000 ($1,200,000) the United States appropriation under the Act of 1890, £110,401 ($552,004) interest or endowment or regular appropriation, £609,684 ($3,048,422) State appropriations for current expenses, and £462,612 ($2,313,060) State appropriations for buildings and other purposes, &c., &c.

The value of the permanent endowment and equipment of these institutions in 1905 is estimated at £700,303 ($3,501,513).

The number of persons in the faculties of the colleges in question was as follows :—For preparatory classes, 475 ; for collegiate and special classes, 2,062. In the other departments the staff aggregated 1,889, making a total of 4,561 persons belonging to the faculties of the land-grant institutions.

It will be observed from the above figures that it is not possible to state precisely how much of the money spent on these institutions is actually allocated to agricultural education, this subject forming but a part of the general system of education given in the land-grant colleges.

The students in 1905 in colleges for white persons were as follows by classes :—Preparatory, 5,072 ; collegiate, 20,020 ; short course or special, 10,196 ; post graduate, 515 ; other departments, 17,830 ; total, 53,633. Considered by courses, in the four-year course, agriculture only numbers 2,526 students, and in the shorter course 3,230 ; horticulture claims for the first only 112, and for the second 38 ; dairying for the first, none, and for the second only 617. By far the greater number of students appear to join the engineering and mechanical classes in the four-year course, *e.g.*, mechanical engineering, 4,227 ; civil engineering, 3,624 ; electrical engineering, 2,934 ; mining engineering, 1,022, &c.

In the shorter course, engineering classes do not appear to be included, but there are 16,657 students in military tactics as compared with 3,230 in agriculture.

The students in similar institutions for coloured persons were as follows by classes :—Preparatory, 4,781 ; collegiate, 709 ; short or special, 409 ; other departments, 683 ; total, 6,582. By courses : agriculture, 1,624 ; industrial courses for boys, 2,494 ; industrial courses for girls, 3,428 ; military tactics, 1,566.

It will be observed that the percentage of students devoted to agriculture is much higher among coloured than among whites.

The graduates in 1905 numbered 5,061, and since the foundation of these institutions 62,081.

Statistics of Experiment Stations in 1905.

Agricultural experiment stations are in operation under the Act of March 2, 1887, in all the States and Territories, and under special appropriation Acts in Alaska, Hawaii and Porto Rico.

Separate stations are also maintained in six States and in Hawaii out of State funds. Sub-stations are also kept up in various States. Exclusive of the latter, there are 55 stations in receipt of Federal grants.

The total income of these stations in 1905 was £305,098 ($1,525,484), of which £143,632 ($718,163) came from the National Government, £108,093 ($540,467) from the State Governments, and the remainder from various sources.

The stations employ 845 persons in the work of administration and investigation, including chemists, agriculturists, horticulturists, dairymen, botanists, veterinarians, foresters,

bacteriologists, irrigation engineers, &c., who are no doubt distributed according to the wants of each locality. There are also 54 persons employed in the stations under the head of "miscellaneous"; 423 of these station officials do a certain amount of teaching in the colleges with which their stations are connected. During the year the stations published 403 annual reports and bulletins, which were distributed to 731,000 addresses. Most of the stations report a constantly increasing correspondence with farmers on a wide variety of topics.

The American System of Agricultural Education.

"The American system of agricultural education," say Dr. True and Mr. Dick J. Crosby in their Bulletin published under this title by the United States Department of Agriculture in 1904, "includes a number of different classes of institutions which, taken together, provide all grades of instruction in agriculture from graduate courses leading to the doctor's degree, to nature study courses in the kindergarten and the primary school. These institutions may be considered under four general heads: (1) Departments of original research and graduate study in agriculture; (2) agricultural colleges; (3) secondary schools of agriculture; (4) primary schools. The secondary and primary instruction in agriculture is of comparatively recent development, but is well worthy of consideration in this connection. The graduate and collegiate courses, on the other hand, are well-established and take rank with the best agricultural courses in the much older universities and colleges of Europe.

"The American institutions for instruction and research in agriculture are brought together to constitute a national system of higher education in the sciences and industries through the Association of American Agricultural Colleges and Experiment Stations, the Office of Experiment Stations of the Department of Agriculture, and the Bureau of Education of the Department of the Interior, each of these agencies being entitled to membership in the Association. This Association was organised in Washington, October 18, 1887, and has since been very active and efficient in its efforts to promote agricultural education. At its convention in 1894 it appointed a committee on entrance requirements for courses of study and degrees,

whose final report, presented two years later, was adopted. This report recommended as a standard of entrance requirements for college courses (1) physical geography; (2) United States history; (3) arithmetic, including the metric system; (4) algebra to quadratics; (5) English grammar and composition, together with the English requirements of the New England Association of Colleges and Preparatory Schools; and (6) ancient, general or English history; and suggested that all colleges should unite in requiring the first five subjects as a minimum for their lowest collegiate class. The committee also urged that the colleges should require for four years' courses leading to a bachelor's degree (1) mathematics, *i.e.*, algebra, geometry and trigonometry; (2) physics and chemistry, with laboratory work in each; (3) English language and literature; (4) other languages (at least one modern); (5) mental science and logic or moral science; (6) constitutional law; and (7) social, political or economic science."

In 1895 the Association appointed a standing committee on methods of teaching agriculture, which presented up to 1904 eight reports, with suggestions as to courses of instruction in agriculture, which have been of great value to colleges in developing their courses in this subject, reducing them to pedagogic form and enabling them to co-ordinate their courses with those of other universities.

At the head of the departments of original research and graduate study stand the United States Department of Agriculture and the agricultural experiment stations in the different States and Territories, which are organised chiefly as departments of the land-grant colleges.

These institutions, organised originally mainly for purposes of research, have done much to promote agricultural education by opening their laboratories and libraries to assistants, who participate in research work by continuing their studies there. The graduates of agricultural and other colleges are thus trained as helpers in scientific work.

The Secretary of Agriculture in his report for 1903 said with regard to the educational work of his department:—

"This department has thus become a post-graduate institution, where groups of sciences are taught and applied. Comparatively little time is devoted to the ascertainment of abstract

facts. Every worker is helping somebody, and while doing this he is contributing to what is known relating to the farm and to the education of his associates.

"Four hundred and ninety-six students have been admitted to the department since 1897 for instruction as experts in our several lines of work; 259 of these still remain with us, not less than 132 having passed into the classified service, 185 having gone elsewhere to teach, to experiment or to demonstrate."

The Weather Bureau of the Agricultural Department takes an active part in public education on meteorological lines through its officials at the various stations throughout the country, and the Bureau of Plant Industry is aiding the school garden movement by distributing packages of seeds with directions how to use them.

The office of experiment stations, however, is the general agency for promoting agricultural education throughout the United States and is constantly extending this side of its work, special attention being given now to the proper graduation of agricultural education from the primary or common schools up to the university courses.

Agricultural Colleges and Schools.

There are 65 agricultural colleges in the United States, organised under the Acts of Congress of July 2, 1862, and August 30, 1890.

The colleges of agriculture may be divided into three classes:

(1) Those offering only agricultural courses.

(2) Those offering additional courses, especially in the mechanical arts.

(3) Those connected with universities.

The only purely agricultural college in the United States is that in Massachusetts.

Agricultural and mechanical colleges exist in Alabama, Colorado, Connecticut, Delaware, Iowa, Kansas, Kentucky, Maryland, Michigan, Mississippi, Montana, New Hampshire, New Jersey, New Mexico, North Carolina, North Dakota, Oklahoma, Oregon, Pennyslvania, Rhode Island, South Carolina, South Dakota, Texas, Utah, Virginia, and Washington.

Separate institutions of this class are maintained for coloured students in 16 States. A similar institution maintained by State and private funds is the well-known Tuskegee Normal and Industrial Institute in Alabama.

Colleges of agriculture (or equivalent schools or departments) in universities are maintained with the aid of national funds in Arizona, Arkansas, California, Florida, Georgia, Idaho, Illinois, Indiana, Louisiana, Maine, Minnesota, Missouri, Nebraska, Nevada, New York, Ohio, Tennessee, Vermont, West Virginia, Wisconsin and Wyoming. In Massachusetts, Harvard College has a school of agriculture called the Bussey Institution.

In nearly all of these institutions the college course in agriculture extends over four or five years. In cases where more than four years are required, an extra year or two has been added to prepare students for admission to the regular course. In some cases students are admitted directly from the common schools, while in others the entrance requirements are on a level with those for admission to other college courses in high grade colleges. Entrance requirements are, however, being gradually raised in many colleges which formerly took students from the common schools.

The course at the Massachusetts Agricultural College may be considered typical of relatively high-grade college courses in agriculture in America. Candidates for admission must be at least 16 years old and are required to pass examinations in English, general history, physiology, physical geography, algebra (including quadratics), plane geometry and civil government. The student must follow a definitely prescribed curriculum for two years, after which he is allowed to select one of the following courses:—Agriculture, horticulture, biology, chemistry, mathematics, and landscape gardening. In "freshman" year the following subjects are included in the course:—Agriculture, botany, chemistry, algebra, geometry, trigonometry, English, French, military tactics, and history. In "sophomore" year:—Agriculture, horticulture, zoology, chemistry, English, and German. In "junior" year the student follows one of the prescribed courses mentioned above, and in "senior" year together with military science, bacteriology and United States constitutional law, he must take at least three optional subjects closely correlated with his junior year course, which

may be selected from the following :—Agriculture, botany, horticulture, landscape gardening, chemistry, physics, entomology, veterinary science, engineering, English, French, German, Latin.

A similar arrangement prevails at the Michigan Agricultural College, where agricultural students pursuing the prescribed course for two years are allowed to choose either agriculture, horticulture or forestry.*

The system of making subjects optional is gaining ground in all the agricultural colleges ; there is also a tendency to divide the subject of agriculture into special branches, such as plant industry (agronomy, horticulture, and forestry), animal industry, agrotechny (dairying, sugar-making), rural engineering, and rural economy.

Dr. True and Mr. Crosby write : "Along with the improvement of the college courses in agriculture has come the realisation of the true function of these courses. It is now well understood that they are for the training of the leaders in agricultural progress and not for the general education of the agricultural masses."

Many of the agricultural colleges have organised short and special courses for students who cannot follow the whole course. An account of the special courses at the Universities of Illinois and Minnesota will be given later.

A good deal is also being done by the colleges in the way of "university extension" movements, by which educational influences are brought to bear through farmers' institutes, and by means of reading courses for farmers, correspondence courses, and the introduction of nature study and school garden work for children.

It would be difficult, if not impossible, within the scope of a report of this nature to give detailed information as to the courses of study in all the agricultural colleges of the United States. Bulletin No. 127, published in 1903, gives, however, not only some very interesting suggestions by the Committee on methods of teaching agriculture of the Association of American Agricultural Colleges and Experiment Stations, but also considerable detailed information as to the

---

* Some of these courses may have been slightly altered since 1904, the date of the publication of the Bulletin from which this information is taken.

working methods of six of the principal agricultural colleges of the United States which are picked out as being among the most typical in the country. Three of these are described below, viz.:—

(1) The College of Alabama, a southern college not connected with any university, (2) the College of Illinois, a university college in which no provision for preparatory work is made, and (3) the College of Minnesota, a university college having an agricultural high school connected with it.

Alabama College.

Five four-year courses lead to the degree of bachelor of science. These are chemistry and agriculture, civil engineering, electrical and mechanical engineering, general course, and pharmacy. Elementary agriculture (breeds of live stock) is taught in the third term of the freshman year in all courses. Agriculture is an optional subject throughout the sophomore year (second year) in civil engineering and is required throughout the sophomore year and junior (third) year of the course in chemistry and agriculture. The student during this course devotes about one-fifth of his time to English, history, and economics, two-fifths to pure science, and two-fifths to applied science and technical training.

Admission is granted to applicants not under 15 years of age, who have passed satisfactory examinations in (1) geography and United States history; (2) English; (3) mathematics, including arithmetic and algebra, up to quadratic equations.

The agronomy course is given during the second and third terms of the sophomore year. This is preceded by a two-hour course per week in animal husbandry during the third term of the freshman year, a two-hour course in dairying during the first term of the sophomore year, and a three-hour course of lectures and one laboratory exercise per week in general chemistry during the first term of the sophomore year, and is followed by courses in systematic and structural botany (lectures and laboratory work), plant physiology, and agricultural chemistry.

The course in agricultural chemistry is given in the senior year and consists of lectures on chemistry as applied to agricul-

ture (two per week during second and third terms), including discussion of origin and composition of soils, fertilisers, rotation of crops, feeding of live-stock, &c.

During the same period students do laboratory work in quantitative analysis for six hours per week. The laboratories, which are open from 9 A.M. to 5 P.M. during six days in the week, are amply supplied with everything required for chemical manipulation.

Two hours per week are devoted to lectures, in which the number of students ranges from 10 to 25, and two afternoons a week are given up to farm practice, during which time the classes are divided into sections of from six to nine students. There are plots in the experiment station farm showing the effect of fertilisers, methods of culture, &c., and collections of varieties are used as object lessons.

The Bulletin above-mentioned gives specimens of examination papers in agronomy for the second and third term of the sophomore year, as well as examples of students' field notes on varieties of cotton and corn.

Agricultural College of Illinois University.

The Agricultural College of the State University at Champaign is one of six colleges in the university, and receives a large grant from the State, the Legislature having appropriated for its support £61,000 for the two financial years beginning July 1, 1907.

Candidates for admission to the college are required to have the same number of high school credits as those for admission to the other colleges. By the term "credit" is meant the work on a subject continuously pursued with daily recitations through one of the three terms of the high school year, or in other words the work of 60 recitation periods of 40 minutes each or the equivalent in laboratory or other practice; 42 credits are now required for admission, and for graduation students must have obtained 130 university credits. By the latter term is meant one class period per week for one semester, each class period presupposing two hours' preparation by the student or the equivalent in laboratory, shop or field practice. The work for 79 credits is prescribed as follows :—

15 credits in agronomy; 5 in thremmatology; $2\frac{1}{2}$ in animal husbandry; $2\frac{1}{2}$ in dairy husbandry; 8 in horticulture; 15 in chemistry; 5 in geology; 5 in botany; 5 in zoology; 2 in economics; 6 in rhetoric; 5 in military science; and 3 in physical training.

Of the remaining 56 credits required for graduation, at least $4\frac{1}{2}$ must be chosen in animal or dairy husbandry, 5 in natural history, 3 in English and 25 in technical agriculture. The remaining credits may be obtained from any subjects offered in the university which the student is prepared to take, provided only that two years' study of a foreign language must be taken, for which from 5 to 10 credits will be allowed, according to the nature of the subject.

The students in the College of Agriculture are given courses in English or other languages in the College of Literature and Arts; courses in chemistry, physics, geology, botany, zoology, mathematics, &c., in the College of Science; blacksmith's work, carpentry, &c., in the College of Engineering, the work of the College of Agriculture being devoted to agronomy, animal husbandry, dairy husbandry, horticulture, and veterinary science.

In the department of agronomy 19 courses are offered, which are described briefly as follows:—

(*Note.*—Roman numerals I, II, stand for semester; Arabic numerals in parenthesis for the number of credits.)

1. *Drainage and Irrigation.* I ($2\frac{1}{2}$).

2. *Field Machinery.*—Class work and laboratory practice, including setting up and testing machines, noting construction and elements necessary for successful work. I (3).

3. *Farm Power Machinery.*—Class room and laboratory work. I (3).

4. *Farm Buildings, Fences and Roads.*—Class work and practice in designing and drawing plans of buildings, working fence building machines, making walks, &c. II (5).

5. *Seeds.*—Quality and preservation. Judging grains, care of stored crops, &c. Class and laboratory work. I ($2\frac{1}{2}$).

6. *Seeds.*—Germination and growth; enemies to growth, weeds, fungi, insects, &c. Class room, laboratory and field work. II, first half ($2\frac{1}{2}$).

7. *Farm Crops.*—Special study of rotation or succession of crops with reference to systematic farming and economic

distribution of labour, methods of culture, &c. Class work supplemented by laboratory work, with special reference to Illinois conditions. Students have an excellent opportunity to study the work of the Agricultural Experiment Station. II (5). If this subject is selected, agronomy 6, or certain courses in botany, must be taken.*

8. *Field Experiments.*—Testing varieties of corn, &c., in fields, methods of planting, culture treating for disease, &c. Special opportunities are given to advanced students to take up experiments under supervision of the instructor in farm crops on certain large farms in the State, for which experiments arrangements have been made with the farmers. II, second half, and summer vacation ($2\frac{1}{2}$ and 5). If this subject is chosen, courses 7 and 12 in agronomy are required.

9. *Soil Physics and Management.*—Study of origin of soils, composition and classification, modes of treatment, ploughing, harrowing, draining, physical effects of different systems of rotation, &c. I (5). With this subject a course in chemistry or physics and one year university work are required.

10. *Special Work in Soil Physics.*—Studies intended for students wishing to specialise further in study of physical properties of soils, *e.g.*, determination by special methods of the temperature, moisture and soluble salt-contents of various soils, &c. I or II (2–5).

11. *Soil bacteriology.*†—Class room and laboratory work. II (5). Courses in botany and chemistry are required with this subject.

12. *Soil Fertility, Fertilisers, Rotations.*—II (5). Required with this subject :—A course in chemistry and courses 6 and 9 in agronomy.

13. *Investigation of the Fertility of Special Soils.*—This course is primarily designed to enable the student to study the fertility of those special soils in which he may be peculiarly interested and to become familiar with the correct principles and methods of such investigations. It will be supplemented by a systematic study of the work of experiment stations along the lines of the

---

* This means that course 6 of agronomy, *i.e.*, the previous course on seeds, or certain courses in botany must have been previously passed.

† Omitted in latest university announcements, 1906–7.

special investigations of the course I, II (2 to 5). Required with this subject: Agronomy 12.

14.* *History of Agriculture* from the earliest times among Egyptians, Jews, &c., to the development of modern agriculture in England, Germany, France, and United States of America, with consideration of systems of British agriculture and their influence upon social conditions. I, second half (2½).

15. *Comparative Agriculture.*—Influence of race, locality, climate, customs, &c., on agriculture of different countries and peoples. What is best under different conditions. Lectures. II (1). Required—Two years' university work.

16. *German Agricultural Readings.*—Study of the latest agricultural investigations published in German, with a view to give a broader knowledge of the advance of scientific agriculture, as well as practical instruction in a foreign language. II (2). Required—Two years' work in German.

17. *Farm Machinery.*—Special work in machinery for students preparing themselves in the expert management of these machines in the field. II, first or second half. (2½).

18. *Investigation and Thesis.*—This course varies in the subject matter of the study, according to the department in which theses are written. The work is under the direction of the head of department. I, II (5 to 10).

19. *Research Work in Farm Mechanics.*—I or II (2½ to 5).

The offices, class rooms, and laboratories of the department of agronomy are housed in the agricultural building, which was erected at a cost of £30,000. It consists of four separate structures built round an open court and connected by corridors. The buildings are of stone and brick, and an adjacent glass structure includes a photographic laboratory and a pot-culture laboratory for the agronomy department. Several acres of land near the buildings are used for instruction purposes, chiefly by means of experiments carried out by students.

Two laboratories are provided in connection with the study of soil fertility, one for the analyses of soils, fertilisers, and manures, the other, already mentioned, for pot-culture experiments.

There are also a soil physics laboratory, two laboratories for

---

* Omitted in latest university announcements, 1906–7.

soil bacteriology, and two for the work in farm crops. Besides the laboratory practice, the students in farm crops carry on plot experiments under field conditions, several acres being provided for this purpose, and hand tools being provided for the use of students.

There are thus special and very well equipped laboratories provided for each of the four principal divisions of study in agronomy, viz., soil fertility, soil physics, soil bacteriology, and farm crops.

A large number of text books and works of reference are in common use, besides which the University of Illinois library contains numerous works and other publications in English, French, and German relating to agriculture.

Laboratory, lecture and field note books are required to be kept by students in all courses of agronomy, and in most cases students are required to prepare two or three essays of from 1,000 to 5,000 words during the semester. As a rule preliminary examinations are held at the end of each month and a final examination at the close of the course. The students standing or grade for the semester's work is based on four factors : (1) Class records of recitations ; (2) preliminary examinations and written exercises ; (3) lecture, laboratory, and field note books ; and (4) final examinations.

The comparative statistics of agricultural students, graduates and undergraduates (men and women) in the University of Illinois for the year 1907 are as follows :—*

	General.		Agricultural (Men) and Household Science Agricultural (Women).
Graduate school	160	of which	15
Undergraduate school, less special students	2,078	,,	185
Special students	464	,,	250
Total	3,702	,,	450†

* Taken from University Bulletin of April 15, 1907.

† It would appear that many of the students are scholars, there being no less than 187 agricultural scholarships for men at the university and some in household science for women.

The total number of students at the university, however, including the Colleges of Law, Medicine and Dentistry, the School of Pharmacy and the Academy amounts to 3,400 men, 916 women, *i.e.*, a total 4,316, of which, as shown above, 450, or about 10 per cent., are taking agricultural courses, while of these 450 no less than 250 are not regular students seeking matriculation but "special students."

It is clear from this that the special students' course in agriculture is the most popular one at the university in so far as instruction in agriculture is concerned. These special students are persons over 21 years of age, not candidates for a degree. They may be admitted to classes after satisfying the proper authorities that they possess the requisite information and ability to pursue profitably, as special students, the chosen subjects. They pay a tuition fee of \$7½ a semester, in addition to the regular individual fee of \$12. No one may enrol as a special student for more than two years except upon recommendation of the faculty of the college in which he is enrolled, and with the approval of the Council of Administration.

After successfully completing 30 semester hours of university work, a special student may receive such credits toward matriculation on account of practical experience in his course as the head of the department, and the dean of the college may recommend and the President of the University may approve.

As regards expenses of students, the university does not furnish board to students, but only tuition. There are a large number of suitable private boarding houses in Urbana and Champaign where students can obtain board and lodging. There are several students' clubs at which the cost of meals is about \$3 per week.

The fees in the agricultural department are as follows :—

Matriculation Fee for every student not holding a scholarship	\$ 10·00
Diploma Fee payable before graduation ..	5·00
Incidental Fee.—All students, not scholars pay each semester an incidental fee of ..	12·00

TUITION FEE.—Students "conditioned" on entrance requirements, and "special" students, except those holding scholarships, pay each semester a tuition fee of ..	\$ 7·50

The average annual expenses of students, including semester fees, board and lodging, and washing are calculated at from \$186 to \$264, or about £37 to £54 10*s*. per annum.

Agricultural College of Minnesota University.

The University of Minnesota consists of the Graduate School, the College of Science, Literature and Arts, the College of Engineering and Mechanical Arts, the School of Mines, the School of Analytical and Applied Chemistry, the College of Education, the University Summer School, the College of Law, the Department of Medicine, the Geological and Natural History Survey, and the Department of Agriculture, which is composed of the College of Agriculture, the School of Agriculture, Short Course for Farmers, the Dairy School, the Crookston School of Agriculture, and the Experiment Stations, *i.e.*, the main station at St. Anthony's Park (near the university) and the sub-stations at Crookston and at Grand Rapids.

The College of Agriculture, with which we will first deal, offers a four-year course in agriculture. The degree of Bachelor of Science in Agriculture is given on completion of the course. Students in this college may also specialise in the line of forestry or home economics and secure the degree of Bachelor of Science in those two subjects.

The university year covers a period of 38 weeks, beginning on the second Tuesday in September and ending on the second Thursday in June.

The State Experimental Farm, upon which are located the buildings of the experiment station and the Department of Agriculture, consists of over 250 acres of very valuable land. The farm is valued at £80,000 and the sub-stations at Crookston and Grand Rapids at £6,000 more, while the buildings and equipment of the Department of Agriculture are valued at over £80,000.

The total estimated revenues of the university are as follows :—

	$
Interest on bonds and land contracts (Federal Land Grant of 1862)	53,000
United States Government Hatch Bill Appropriations	15,000
United States Government Morrill Bill Appropriations	25,000
Total from Federal Government ..	93,000
Appropriations from the State Government	263,500
Students' fees	126,000
Dental Infirmary receipts	12,000
Station and school, sales and fees	14,000
Miscellaneous receipts, university ..	2,000
Total	510,500

Or about £102,100, of which £18,600 is contributed by the Federal Government and £52,700 by the State Government.

There are various libraries and museums, an astronomical observatory, and a gymnasium attached to the university.

The faculty of the College of Agriculture is represented by 9 professors and 1 preceptress, by 6 instructors and 2 instructresses, and by 6 assistant instructors.

Graduates of the School of Agriculture attached to the college and graduates of approved high and normal schools are admitted forthwith to the freshman class in the College of Agriculture. Students from other colleges and universities are allowed favourable conditions for admission.

Graduates of the School of Agriculture may be admitted as special students and allowed to pursue such studies in the course of the College of Agriculture as are approved by the faculty.

Graduate Work.—Special facilities are offered to graduate students of this and other agricultural colleges who wish to become familiar with the methods of work employed on the experiment stations and to pursue their collegiate studies further. The degree of Master of Science in Agriculture and Doctor of Science can be obtained by graduate students of the Minnesota or any other agricultural college on certain conditions.

Fees.—All college students, residents of the State of Minnesota, are charged an incidental fee of £2 per semester, non-residents pay £4.

The college course required for graduation extends over four years for graduates of the School of Agriculture, viz., the freshman, the sophomore, the junior, and the senior years. For the first two years the lines of study are prescribed, the subjects being chosen with a view of giving a good foundation for the work which follows. For the last two years the work is mostly optional and gives the student an opportunity to take work along lines for which he has a special aptitude.

In the College of Agriculture a part of the work is taken in the College of Science, Literature, and Arts. Such work consists of higher algebra, drawing, geology, German, French, rhetoric, trigonometry, botany, zoology, psychology, English literature, logic, philosophy, pedagogy, and history.

The courses of instruction in the College of Agriculture embrace the following subjects :—

A.—*Agriculture*—

I. Seeds.
II. Field crops.
III. Thremmatology.
IV. Plant breeding.
V. Agricultural engineering.
VI. Agricultural economics.
VII. Farm management and agricultural practice.

These studies are pursued in the lecture room, the laboratory, and the field. There is a seed-breeding laboratory and plant-breeding nurseries. Farms in the vicinity serve as a basis for designing farm plans, &c. Machinery is exhibited at the State Fair grounds adjoining the University Farm, and also at the warehouses of Minneapolis and St. Paul, as well as at the University Farm.

B.—*Agricultural Chemistry*—

I. General agricultural chemistry.
II. Agricultural qualitative analysis.
III. Agricultural quantitative analysis.
IV. Human and animal foods.
V. Soils and fertilisers.
VI. The analysis of foods.
VII. Analysis of soils and fertilisers.

VIII. Special problems, *e.g.*, analysis of water for irrigation purposes, adulteration of foods, &c.
IX. Chemistry of forestry by-products.

C.—*Animal Husbandry*—

I. Stock breeding.
II. Feeding animals.
III. Stock judging.
IV. Stock farm management.
V. Animal nutrition studies.
VI & VII. Animal husbandry.
VIII & IX. Meat studies and judging.
X. Stock records and compilations.
XI. Animal by-products.
XII. Animal mechanics.

Examples of some of the leading breeds of cattle, sheep, and pigs are kept on the University Farm. Experiments in feeding and breeding are undertaken every year with these animals. Herds of blooded stock near the university and the annual show of live stock at the State Fair serve for extended observation of breeds and methods of management.

D.—*Dairy Husbandry*—

Students in the college have the advantage of practical instruction in the dairy school and in the dairy division of the experiment station.

I. Dairy stock and dairy farm management.
II. Feeds and feeding.
III. Factory dairying and dairy practice, *i.e.*, two semesters in compounding rations, feeding cows, rearing calves, milking, &c., and operating separators, &c.

E.—*Entomology*—

I. General entomology.
II. Economic entomology.
III. Forest entomology.
IV. Comparative anatomy and histology of insects.

F.—*Farm Structures.*

G.—Veterinary Medicine and Surgery—

I & III. Anatomy.
II. Bodily nutrition.
IV. Diseases of domestic animals.

H.—*Horticulture—*

I. Fruit growing.
II. Systematic pomology.
III. Plant breeding.
IV. Nursery work.
V. Floriculture.
VI. Greenhouses and their management.
VII. Vegetable growing.
VIII. Landscape gardening.

There is also in connection with the college a special course in forestry and home economics.

The total number of students in all branches in the Department of Agriculture of the university in the year 1906–7 amounted to 824. Five of these appear in more than one branch, so that the actual number was 819.

School	564
Farmers' short course	82
Dairy school	106
	752
College	72
Total	824

It will be seen from the above that, judging by the number of students, this college is not so important as that of Illinois, and that the High School, of which a description follows, is considerably more popular than the college.

Minnesota High School.

The purpose of this school, which was founded in 1888, was to give a practical education to young men and women who are unable to pursue a full college course of agriculture.

Its course of study covers a wide range of subjects and is mainly technical in character, though provision is made for

some instruction in English and mathematics. Instruction is given in the workshop, laboratories, barns, and fields, as well as in the class room. The course requires three winters of six months each for completion and is open to both sexes. Much of the work is taken in common by young men and young women. Some of the subjects, such as blacksmith's work, carpentry and field work, handling grain and machinery, are taken up by young men, while young women pursue cooking, sewing, laundry and household work. The methods of instruction tend to educate students for rural occupations and to develop in them a love for farm life by showing them its possibilities. In this respect the school has been very successful, as over 80 per cent. of its graduates are engaged in agricultural pursuits.

For admission all male students are required to have had six months' farm practice before entrance. Students who have completed eighth grade work in common schools are admitted without examination. Others may be admitted on having certificates of admission properly filled up by former teachers or school superintendents, &c.

There is a strict supervision over students boarding in the school dormitories. They are not allowed to leave the grounds without permission.

The requirements for graduation are: (1) The completion of the prescribed course of study in a creditable manner; (2) an essay of not less than 1,000 words upon a topic connected with agriculture; (3) for young men, a practical experience in field work at the University Farm or elsewhere, as shown by reports received from responsible sources.

Fees.—With the exception of an entrance fee of £1 to residents and £2 to non-residents, the school makes no charge. The necessary expenses for the year are reckoned not to exceed £17, but this amount does not include the cost of uniform, which consists of a navy blue blouse, trousers, and cap, costing in all about £2 10*s*.

On entering the school the student makes an advance payment of £2 8*s*. for board covering four weeks, of £1 deposit as guarantee for loss of books and other articles borrowed, 8*s*. for rent of books and reading room, 4*s*. towards maintaining nurse, £1 entrance fee, and 8*s*. reserve fund.

The courses of instruction, which cover a period of three

years, consist of: 1. Agricultural botany. 2. Agricultural chemistry. 3. Agricultural physics. 4. Agriculture, covering elementary principles governing soils, field and farm management. 5. Algebra. 6. Blacksmith's work. 7. Breeding stock. 8. Carpentry. 9. Civics, *e.g.*, nature and various forms of government, management of local institutions, &c. 10. Comparative physiology. 11. Cooking. 12. Dairy chemistry. 13. Dairy husbandry. 14. Domestic chemistry. 15. Domestic hygiene. 16. Drawing. 17. Dressing and curing meats. 18. English. 19. Entomology and zoology. 20. Farm accounts. 21. Farm arithmetic. 22. Feeding. 23. Field agriculture. 24. Field crops. 25. Forestry. 26. Fruit growing. 27. Geometry. 28. Gymnasium. 29. Handling grains and machinery. 30. Home economy. 31. Home management. 32. Household arts. 33. Laundry work. 34. Library. 35. Literary society work. 36. Meats, selection and value of certain classes of meats and best methods of curing, &c. 37. Military drill, in accordance with the Federal Act of 1862, (for all male students who are physically fit in the B and C classes drill is obligatory, for students in the A class it is optional. The United States Government furnishes the Agricultural Department with the necessary arms and equipments, and details an officer of the regular army for instruction in military science and tactics). 38. Music. 39. Physical training. 40. Plant propagation. 41. Poultry. 42. Practical instruction in barns and fields, in land surveying, laying tile drains, building fences, setting up machinery, splicing ropes, &c. 43. Sewing. 44. Social culture, including the usages of society, manners, voice, conversation, &c. 45. Soils and fertilisers. 46. Stock judging. 47. Study of breeds. 48. Vegetable gardening. 49. Veterinary science.

There is also an intermediate year for graduates of the School of Agriculture desiring to enter the College of Agriculture.

The following is the course prescribed for such students :—

First Term.	Second Term.
Elementary algebra (5).	Higher algebra (5).
Plane geometry (5).	Solid geometry (5).
English (5).	English (5).
General history (5).	Economics (4).

There is further a short course provided for farmers who cannot attend the regular school course. This term opens on the 10th of January and lasts six weeks. The first two weeks are devoted to judging grain, soils, and live stock. This is followed by a four-weeks' course of lectures covering the more important branches of agriculture, horticulture, stock breeding, farm botany, farm chemistry, entomology, poultry, dairying, &c. For the entire course a fee of £2 is charged.

There is a special dairy school attached to the Agricultural School with a staff of 17 instructors and assistants. This is designed to furnish persons actually engaged in making butter and cheese with an opportunity to become more skilled in their work and also to study problems directly bearing on dairying industry.

Instruction is divided into the following seven courses and opens on the 18th of November, extending over four weeks: (1) Lectures covering the entire field of dairying industry; (2) practical work daily in the butter room; (3) practical work daily in the cheese room; (4) practical work in the laboratory, examining milk, making daily composite tests, and pasteurisation; (5) practical engineering, steam fitting and plumbing; (6) practical work in bookkeeping; (7) practical work with cultures and starters.

Wisconsin County Agricultural Schools.

One of the most interesting experiments in secondary agricultural education has been the establishment of county schools in Wisconsin, started under the Agricultural School Law of Wisconsin of 1881. The following is a summary of this law as amended in 1893:—

Sections 1, 2 and 3 provided for the creation of schools of this class and for County School Boards of three members. Section 4 allows two or more counties to unite for the purpose of establishing one school. Section 5 makes the County Treasurer, the School Treasurer. Section 6 defines the branches of instruction to be given. Section 7 requires a plot of three or more acres for farm purposes. Section 8 makes the school free to students of any county which helps to support it. Section 9 makes the State Superintendent of Education also Superintendent of such schools. Section 10 provides for list of

four schools, when approved by the Dean of the College of Agriculture and the School Superintendent. Cost of maintaining each school is to be reported to the latter. Each school must be maintained eight months in the year. The State grants to any county maintaining such a school "a sum equal to two-thirds the amount actually expended for maintaining such a school, provided that the total amount so apportioned shall not exceed £800 to any one school in any one year."

These schools are described in a special Bulletin issued by the Federal Department of Agriculture, and a special account of the Dunn County School has also been published.

From these it appears that these agricultural county schools, which are two in number, the Dunn County and the Marathon County Schools of Agriculture and Domestic Economy, were opened in Wisconsin in 1902. Marinette County will open a school of the same class this year, and other counties are considering the advisability of following this example.

These schools were equipped at the expense of the counties in which they are located. This is true as to buildings, furniture, apparatus, machinery, and stock, but the State aids each school to the extent of £800 a year, to be applied to current expenses. The total annual current expenses have hitherto only amounted to £1,200 for each school.

The Dunn County School of Agriculture has its principal buildings located in the centre of Menomonie, the capital of the county; there is room on the same site for poultry runs and a small garden for girls. These grounds were given to the school. The farm area of six acres is situated nearly a mile from the school. Here boys get practice in farm, orchard, and nursery work during the spring term. In Marathon County the school is located outside the town on a seven-acre farm, obliging students to walk some distance to school, but their farm work is close to the school buildings.

The Dunn County School has four buildings—a main building, of which the first and second floors are devoted to the School of Agriculture, and the third floor to the County Teachers' Training School. On the lower floor is a general laboratory, 20 ft. by 40 ft., in which elementary science is taught; a serving and lecture room, 20 ft. by 30 ft.; laundry and bath room, 14 ft. by 33 ft.; dynamo room, 11 ft. by 14 ft.; men's wash

room, 12 ft. by 12 ft. ; locker and dressing room, 14 ft. by 14 ft. ; and four ventilating rooms.

Second floor (reached by the main entrance) : Assembly and study room, 40 ft. by 40 ft., holding 90 single desks ; kitchen, 19 ft. by 32 ft. ; dining room, 19 ft. by 20 ft. ; principal's office and library ; ladies cloak room, and telephone room.

Third floor : Assembly room, two recitation rooms, principal's office, &c.

The attic is unfinished, but is used as a recreation room in bad weather.

The mechanical building of the school is 24 ft. by 50 ft. and two stories high. The basement is divided into two sections, used by the blacksmith's and by the dairy class. The main floor is given up to carpentry and the upper floor is used for storage of wood, &c.

The horticultural building is two stories high over a basement which is used for potting, grafting and budding lessons, winter storage of bulbs, &c. The main floor has a poultry department and a large room for keeping and exhibiting machinery and tools. The upper floor consists of one large room which is used for games and gymnastic exercises.

There is also a small farm tool house in the grounds of the school farm.

The probable number of scholars that could be accommodated at either of the county schools at one time is about 125. In the fifth year, 1906–7, 76 scholars were enrolled in the Dunn School.

The School Board has lately decided to make the school entirely free to all students resident in Wisconsin until the numbers become too large, when a tuition fee will be charged. Books are furnished by the school, and students pay 1*s*. per month for the use of all of them.

Students on entry should be 16 years of age or over, but young people may enter the school at any age. The regular course covers two years of eight months each, beginning in October and closing in May.

The subjects taught in the school are :—

For Young Men : Science of agriculture ; soils and fertilisers ; dairying ; poultry raising ; stock feeding and management ; stock breeding, judging, and marketing ; plant life ; economic

insects and plant diseases; vegetable, fruit and flower gardening; farm carpentry and blacksmith's work; pipe fitting; rural architecture and building; business arithmetic; farm accounts and commercial forms; history; civil government.

For Young Women: Cooking; chemistry of foods; invalid cookery; home economy; personal and domestic hygiene; sewing; millinery; home nursing and emergencies; poultry raising; principles of gardening; history; civil government.

There is also a winter short course at the Agricultural School intended primarily for older persons or for young people who for some reason or another are unable to take an extended course of study. The complete short course covers two winter terms of 12 weeks each, beginning in January and ending in March. The following are the subjects:—

For Men, first winter: Soils, drainage, manures, farm accounts and commerce, dairying, farm carpentry and architecture.

For Men, second winter: Feeding and care of stock, blacksmith's work, soils and fertilisers.

The dairying instruction includes full lessons in regard to running farm separators and the manufacture of butter. Students receive practical training in the ripening of cream, churning, marking and packing of butter, testing the value of milk and cream by the Babcock method.

The dairy is equipped with cream separators, Babcock testers, combined churn and worker, ripening vat, milk heater, scales, and complete set of utensils. Students run a steam boiler and engine and gasoline engine in operating the machinery. All arrangements are quite sanitary and modern; milk is bought from farmers who bring it to the dairy, and the butter is sold to local customers and stores.

Inspection trips are also made to the best creameries and dairies in the neighbourhood.

In the same way the instruction given in animal husbandry, is divided into two terms. Work under the headings of "feeds and feeding" and "care of animals" is made very practical by trips to the best farm barns and stables in the county to study methods of housing, feeding and handling, and by examination of many sound and unsound animals of all kinds. Stock judging is also carried on by classes.

The same system of taking the students on visits to the best vegetable, fruit and flower gardens of the county obtains in regard to the instruction in these subjects.

Machinery and tools seem largely supplied to the schools by makers for advertising purposes.

Indeed one of the most interesting facts in respect to agricultural education throughout the United States is the manner in which farmers and machinery makers and store keepers co-operate in the work by allowing inspection of their stock and premises, by the offering of prizes for judging competitions, and the supply of machinery and samples gratis to schools and colleges.

Many students of the Dunn County School have found it possible to earn money for themselves during the time they attend the school by making useful articles in the carpenters' shops, &c. This is encouraged by the authorities.

The useful and practical side of the knowledge and training given is most emphasised. At every point the school is made to co-operate with the farm, the workshop, the dairy and the home. The manual training courses are stated to be far more practical and useful than is usually the case in such courses. Nearly all the time of the classes is engaged in making articles of use on the farm, in the home, in the school, and in the workshop. The same feature of useful and practical training prevails in domestic economy, plant life, farm accounts, study of soils, poultry, &c., &c.

Other Secondary Agricultural Schools.

Other secondary agricultural schools in the United States are to be found in Alabama, which possesses nine, one in each Congressional district, supported by State and local funds.

The California Polytechnic School at San Luis Obiopo is a State institution established under an Act of March 8, 1901. Agriculture, science, and mechanics are the main lines of instruction in this school, which consists of two large buildings on a farm of 280 acres.

There is also a Roman Catholic secondary school at Rutherford, Napa County, California.

Connecticut, Indiana, and Massachusetts have each one school of this class, the latter being that at Mount Hermon, founded by

the late D. L. Moody. Massachusetts also has several institutions giving courses of horticulture for women. Missouri has three State schools giving agricultural instruction.

New Jersey, Ohio, and Pennsylvania have each one high school specially devoted to agricultural instruction, and a girls' industrial college was opened in Texas in 1903, in which considerable attention is given to horticulture, dairying, bee-keeping, and poultry keeping.

Secondary courses in agriculture have been organised this year in the Montana and Idaho Colleges, and in the Public High School of St. Louis, Michigan. Agriculture is also taught in 200 high schools in Missouri, in 30 in Ohio, and in one or more in 21 other States of the Union. Recent legislation in Virginia provides for the establishment of public high schools under the authority of the State Superintendent of Education. About 150 such schools will be opened shortly, in each of which instruction in agriculture will be a feature of the course.

Primary Schools.

The Annual Report of the Office of Experiment Stations for the year ending June 30, 1907, has an interesting chapter on Primary Schools. It is stated that there is an ever-growing sentiment throughout the country in favour of giving some agricultural instruction in these schools.

The laws of over 30 States now permit or require the teaching of agriculture in primary schools. Among the States which require it are Alabama, Louisiana, Maine, Maryland, Mississippi, North Carolina, South Carolina, South Dakota, and Wisconsin. Ohio reports that elementary agriculture is taught in about 500 township schools, and this subject is regularly taught in rural schools numbering about 4,500 in Wisconsin, 3,000 in Missouri, 300 in North Dakota, and in a considerable number of schools in Alabama, Georgia, Illinois, Indiana, Indian Territory, Iowa, Louisiana, Maine, Nebraska, New Hampshire, New York, North Carolina, Pennsylvania, South Carolina, South Dakota, Virginia, and Washington.

Permissive or mandatory legislation concerning the teaching of agriculture in elementary schools is usually accompanied by provisions making it one of the subjects in which teachers may or must be examined.

Departments of Education for the special purpose of training teachers of agriculture have now been established at many colleges. Many have also announced as a new feature in their catalogues normal courses, in which agriculture has a place. Summer schools for teachers have also been opened this year in connection with a good many agricultural colleges. It is evident, therefore, that a strong effort is being made to provide the teachers required by the new State legislation in respect of agricultural instruction in primary schools.

With the help of farmers' organisations co-operating with agricultural schools and colleges, boys' agricultural clubs have been formed in various States. The members of these clubs have regular institute meetings and lecture courses, go on excursions to educational institutions and large farms, conduct a large variety of tests with corn, sugar, beets, cotton, and other crops, and exhibit their products at school, county, and State fairs. A very general movement in favour of instruction in primary schools has, therefore, clearly begun to spread over the country, but it is too soon as yet to give any account of the shape it will eventually take or the effect it has had.

REPORT OF DR. A. C. TRUE, DIRECTOR OF OFFICE OF EXPERIMENT STATIONS, ON "PROGRESS IN AGRICULTURAL EDUCATION FOR THE YEAR, 1905–1906."

In this report Dr. True begins by stating that during the year 1906 increased attention had been given to the needs of public high and common schools, which were rapidly increasing their demands for assistance in connection with the study of nature and agriculture. Several hundred lectures were delivered at the public schools by officials in charge of the Weather Bureau. The Bureau of Plant Industry was active in assisting in school garden work. It supplied a total of 175,000 packages of seeds of flowers and vegetables to schools in many different States, and gave instruction in agriculture and horticulture to normal school students in Washington City. The school grounds in that city are planted on plans prepared by the scholars, and school garden methods are followed at home by the students if the opportunity offers. A small area of land is also set aside on department grounds for practical teaching and work. With a view to giving children an idea of the

importance and value of the principal crops in the country, plants are grown representing specifically the area in acres devoted to common agricultural crops, and studies in geography, &c., are correlated with these garden plantings. In addition, common systems of crop rotations are illustrated.

A Department of Agricultural Education has been established at the Office of Experiment Stations, which records and publishes text books and manuals on this subject, together with notes and reports on the agricultural schools in the United States and other countries.

A circular on the teaching of agriculture in the rural common schools was widely distributed, and also a leaflet giving a list of the educational publications of the office. Upwards of 200 agricultural lantern slides were prepared by the department and frequently used in lectures, both to school teachers and children.

Delegates from the office also attended the International Congresses held at Liège in Belgium during the course of the year.

At the 19th Annual Convention of the Association of American Agricultural Colleges and Experiment Stations, held at Washington, 1905, Professor K. C. Babcock read a paper in which he emphasised the fact that comparatively little was at that time being done to train agricultural teachers for small towns and rural communities. He urged that the land-grant colleges should help the normal schools by offering short courses for teachers, holding institutes, and sending out their officers to give courses and lectures in normal schools. Dr. A. C. True also laid stress on the same point, and suggested that the colleges should get more into touch with school officers and teachers. Elementary and secondary courses in agriculture and mechanic arts were, he said, required to attract students to the land-grant colleges.

One of the most important actions of the Convention in 1905 above referred to was the reorganisation of its standing committee, which is in future to be split up into four sections: (1) For dealing with instruction in agriculture; (2) with graduate study; (3) with extension work; (4) with experiment station organisation and policy. The association also instructed its executive committee to take steps to secure the establishment of a Department of Rural and Agricultural Education in the National Educational Association.

As regards the work of the agricultural colleges, Dr. True writes that the most notable feature of progress made was the increase in the number and variety of enterprises for extension work. Brief courses in the judging of live stock and grain were given at a number of colleges, and special short courses and summer schools for teachers were conducted in more States than ever before.

In 1905 the agricultural colleges of 17 States and of the Province of Ontario, Canada, sent delegations of students to the International Live-Stock Exhibition, held annually at Chicago. This action produced educational results of considerable value. The students took part in the competitive judging tests for horses, cattle, sheep, and pigs, and also for grain. The colleges contributed a large number of animals to the show.

An interesting fact was that the grand championship of a fat stock show was won by an Angus steer selected a year before from a car-load lot by a professor at the Iowa State College. This was the fourth time that this prize had been won by a college or experiment station animal. The success of the colleges in these competitions proved the high ability of professors in picking out prize animals from market lots and in feeding them and finishing them to perfection. Other colleges that won prizes for different animals were Nebraska, Ohio, Iowa for pigs, and Wisconsin for sheep. These collegiate successes have also had a great influence in popularising agricultural education, and the college and station men are consequently, according to Dr. True's report, much respected for their practical knowledge by the farmers who frequent the show. Of the judges of the show, nine were men connected with the agricultural colleges and experiment stations.

Rural Schools.

Dr. True points out that there was at the time of writing (1906) a growing conviction among leading educationalists in the United States of America that agriculture should be taught in the rural schools. The subject was discussed at the National Educational Association's meeting held at Ashbury, N.J., in 1905. One of the Superintendents of Schools in New York City, speaking on the subject, said: "The rural schools have added to our difficulties by teaching

their pupils only what seemed most necessary for their success when they should move to the city. The farms of New England are, in large measure, deserted or are passing into alien hands. To retain the country boy on the land and to keep our soil from exhaustion, it is high time that all our rural schools turned their attention, as some of them have done, to agriculture. . . . The gain for the nation would be incalculable. Scientific agriculture practically taught, is as necessary for the rural school as is manual training for the city school."

A very important report on the subject of industrial training (agriculture, domestic science, and manual training) was submitted to the meeting by the committee especially appointed by the association in 1903 to investigate the subject. In general the decisions arrived at may be stated as follows :—

(1) On account of want of rooms, the quality of teaching, the immaturity of many pupils, and the crowded condition of the programme, but little in the way of industrial or agricultural education can be expected in the existing one-room district schools.

(2) That in a consolidated school* having at least four teachers, one of whom is prepared to teach the elements of agriculture and manual training, much more can be accomplished. The committee therefore favours the consolidation of the one-room district schools, and recommends that wherever this can be accomplished agriculture be included in the programme, and that a room be provided in the school house for this purpose, and plots of land set apart for illustrative or experimental work in agriculture.

(3) That in township or other distinctly rural high schools attended by a considerable number of children, such a modification of courses, especially in regard to agriculture and domestic sciences, be introduced, as local conditions may make feasible. Teachers must be secured who have been specially prepared, and a text book treating of botany from an agricultural or economic standpoint is needed.

(4) That the success of the existing agricultural and industrial high schools, few as they are, presents the strongest reasons for the organisation of this type of school in large numbers. The

* *I.e.*, a school formed by the amalgamation of two or three distinct schools in neighbouring districts.

committee believe that the establishment of secondary schools, essentially industrial in their character, to be an absolute necessity for the proper development of the rural school system.

(5) That while much has already been done by the agricultural colleges and experiment stations, they could yet do much more in assisting elementary or secondary schools as regards industrial education, and that this should be made a prominent feature of their work.

(6) That the mastery of such industrial education as is within the capacity of elementary and secondary school pupils is of greater utility and value than any other form of knowledge at present acquired with the same expenditure of time and effort.

(7) That to popularise this side of education it is necessary to show immediate practical results, so that it may win the support of the rural population who maintain the schools.

(8) That the courses of study in rural schools should be framed to meet the needs of the children attending them and not with a view to preparing a small percentage for entering some higher school.

(9) That it is possible so to organise the rural school system as to present a regular series of schools from the primary to the agricultural college, while arranging the work for the immediate needs of pupils at each stage, and without abridging opportunities for ultimate advancement to higher grade.

(10) That, owing to the comparatively recent interest taken in this subject, teachers in elementary and secondary schools are not yet properly prepared for it, and therefore special opportunities and inducements should be offered to them with this object.

(11) That boys' and girls' clubs for industrial work outside the school, clubs of farmers and farmers' wives for agricultural courses, &c., should be organised with the help of County and State Superintendents, and agricultural high schools and colleges, so as to arouse interest in the subject.

(12) In view of the unpreparedness of most school teachers at present to give instruction in agricultural subjects, and the fact that if they were generally ordered to do so now the result would be probably failure and reaction, the committee are of opinion that it would be unwise that any State should pass laws

making the teaching of the elements of agriculture, manual training, or domestic science compulsory in all schools. But it advises strongly that every effort be made for the proper preparation of country school teachers to begin this instruction, and that every encouragement and inducement be offered those prepared to undertake it to introduce and carry it on in the schools under their charge.

The report of the committee also contains a programme drawn up by Professor Mays for connected courses of study for rural schools and for the industrial course in the consolidated rural school, through the Agricultural High School to the Agricultural College. This is based on the courses of study obtaining in the rural schools of Wisconsin, which are probably the most advanced in the United States of America, the Minnesota Agricultural High School, and the collegiate agricultural course of the Minnesota University, with certain additions and changes. The object kept prominently in mind in preparing these courses was that of giving *in each low grade those practical things which promise to be especially valuable to the pupil who drops out.*

Professor Mays points out with regard to elementary schools that any given school in regard to agricultural instruction must adopt a course suitable to its own conditions. Thus while a teacher in a one-room school might take up a few of the nature-study courses adapted to the first five grades, and some of the courses in agriculture and home economics outlined for the sixth, seventh, and eighth grades, teachers in a consolidated school could undertake a great deal more of this work.

He is of opinion that uniformity in all schools in work is not a matter of the first importance. The main thing should be to give more training to all, however early or late they may drop out of school. *Making practical education universal in the lower schools is the real problem*, and the chief function of the higher schools is to make possible more technical education in the lower schools where all pupils may receive some benefit.

The course suggested by the Professor is as follows. It is given here because it is to all intents and purposes that of the Wisconsin rural schools and of the Minnesota High School and Agricultural College, and therefore has a practical value in this place:—

Consolidated Rural School Course.

First Year.—Reading, writing, spelling, music, language, nature study, number work, general exercises.

Second Year.—Reading (using in part themes from nature, the farm, and the home), spelling, language, number work, writing, music, hygiene, history, drawing, nature study, general exercises.

Third Year.—Reading (nature stories forming a part), spelling, language, arithmetic, writing, music, geography, hygiene, history, nature study, general exercises.

Fourth Year.—Reading (country life literature included), spelling, language, arithmetic, writing, music, geography (including distribution of farm products), hygiene, drawing, nature study, general exercises.

Fifth Year.—Reading (including stories of our country and lessons in agriculture and home economics), spelling, language, arithmetic, writing, music, drawing, geography (including in part physical geography in respect to the work done by nature's forces in preparing soils), history, physiology, nature study, general exercises, literary society work.

Sixth Year.—Reading (including animal life and adventure), spelling, language, arithmetic, writing, music, drawing, geography, history, physiology (including principles of nutriton and food values), co-operative enterprises, agriculture (first half year, affairs of agriculture; second half, the soil), general exercises (for boys, wood work; for girls, sewing), literary society work.

Seventh Year.—Reading and literature, spelling, grammar, arithmetic, writing, geography (combined with physical geography), music, history, co-operative enterprises, agriculture (farming schemes and crops), general exercises, literary society work.

Eighth Year.—Reading and literature, spelling, grammar, arithmetic (including farm problems, land surveying, and farm statistics), music, geography, history, agriculture, general exercises, literary society work.

Ninth and tenth, or first two high school years, are placed in the consolidated rural school. The figures indicate the number of weekly recitations of respective studies.

Ninth Year.—High School Year. First Half Year—Agricultural botany (4), elementary algebra (5), English (4), drawing farms and buildings (2), rhetoric (1); *Boys:* Rural engineering (3); *Girls:* Sewing (2), agriculture (1). Second

Half Year—Agricultural botany (4), elementary algebra (5), English (4), farm accounts (4), rhetoric (1); *Boys:* Fences and farm buildings (2); *Girls:* Cooking (2).

Tenth Year.—High School Year. First Half Year—Plane geometry (5), physiology (foods and feeds) (4), civics (4), general history (5), rhetoric (1); *Boys:* Judging stocks and seeds (1), carpentry (2½); *Girls:* Sewing (2). Second Half Year—Plane geometry (5), English (4), agricultural mathematics (4), general history (5), rhetoric (1); *Boys:* Judging stock and seeds (1), carpentry (2½); *Girls:* Sewing (2).

Agricultural High School.

Eleventh Year.—High School Year. First Half Year—Fruit-growing (3), higher algebra (5), agricultural physics (4), drawing (1), poultry (2), dairy husbandry (2); *Boys:* Carpentry (2), military drill (2), gymnasium (1); *Girls:* Social culture (1), laundry work (2), physical culture (2). Second Half Year—Solid geometry (5), elementary chemistry (5), agricultural physics (5), dairy husbandry (2½); *Boys:* Drawing barns (2), study of breeds (2), military drill (2), gymnasium (1); *Girls:* Home management (1), drawing farmhouses (1), sewing (2), physical culture (2).

Twelfth Year.—High School Year. First Half Year—Chemistry of plants and animals (5), forestry (3), entomology and zoology (5), dairy chemistry (2); *Boys:* Breeding animals (2), veterinary (2½), blacksmith's work (2½), military drill (2), gymnasium (1); *Girls:* Cooking (2), household arts (1), sewing (2), physical culture (2). Second Half Year—Plant propagation (3), farm management (2); *Boys:* Breeding crops (1), field crops (2), dressing and curing meats (1), feeding animals (3), soils and fertilisers (5), veterinary (2½), blacksmith's work (2½), military drill (2), gymnasium (1); *Girls:* Meats (1), English (4), pedagogy (4), cooking (3), sewing (3), home economy (1), dietary studies (3), domestic hygiene (1).

The outline below is made somewhat optional, the specific statement following showing what is included in each of the subjects from among which the student may select.

Agricultural College.

Freshman Year.—(*a*) Required for graduates of Agricultural High Schools. First Semester—Mathematics (4), drawing (4),

botany (4), French, German, or Spanish (4), military drill or gymnasium (2). Second Semester—Mathematics (4), chemistry (2), German, French, or Spanish (4), botany (4), military drill or gymnasium (2), literature (2).

Note.—The modern languages selected must be pursued for the full two years.

(*b*) Graduates of City High Schools take in lieu of the above Freshman course, a full year of prescribed technical work in agriculture or home economics in an approved Agricultural High School, choosing technical subjects as from the Agricultural High School course given above.

Sophomore Year.—First Semester—Rhetoric (3), agricultural chemistry (4), German, French, or Spanish (3), agricultural physics (2), military drill or gymnasium (2), zoology (3). Second Semester—Geology (3), zoology (3), agricultural chemistry (4), German, French, or Spanish (3), agricultural physics (2), rhetoric (1), military drill or gymnasium (1).

Junior Year.—First Semester—English (3), various academic and technical subjects. Second Semester — Agricultural economics (3), various academic and technical subjects.

Senior Year.—Various academic and technical subjects.

Note.—Minor agricultural subjects cover not more than two semesters' work in the junior and senior years. The major agricultural work includes a graduating thesis and a year of practical work, and is to be carried through the junior and senior years.

Secondary Schools.

Dr. True states in his report that considerable progress was made during the year 1905–06 in the definite recognition of instruction in agriculture as a proper part of the public high school system.

One drawback to giving instruction of this sort in high schools was that no credit for this was given to students for graduation on entrance to college.

The Council of the State University of Missouri, therefore, desiring to promote agricultural education, decided to allow credit of one unit on entrance requirements for a year's work in agriculture at a high school.

The Regents of Education of New York State also reached

a similar decision, restricted however by the condition that the courses in nature study and elementary agriculture must show educational value comparable with those of other subjects now recognised in their examinations.

With reference to the co-ordination and graduation of agricultural education from the elementary schools to the colleges, an interesting pamphlet was issued in 1902 by the Office of Experiment Stations (Circular No. 49), being an extract from the Seventh Report of the Committee on the methods of teaching agriculture. In this report, after dwelling on the pressing need for the establishment of institutions and courses for instruction in agriculture, and pointing out how city and high schools are being specially developed with reference to different forms of business and manual arts, the Committee assert that in order to bring agricultural education into line with the prevailing movement for technical and manual instruction in secondary schools and courses, several changes would be required in the then existing school system. These changes would consist in making the college courses in agriculture of real college grade, which had apparently hitherto been impossible, owing to the absence of any general agricultural course in high schools. Agricultural high schools should, therefore, be established in connection with the colleges which would offer a secondary course completing itself with some definite training in agricultural subjects. It was believed that this would be a better plan than to have courses which would merely be preparatory college courses given in those institutions themselves.

The Committee also suggested the establishment of agricultural courses in town high schools, since many pupils were no doubt drawn from the neighbouring country districts.

Agriculture, according to the Committee's report, had been up to that time almost entirely neglected in the high school programme, and it was high time to make an effort to remedy this. As a practical measure, therefore, the Committee proposed that such courses might be added to those of already existing high schools by the addition of a single teacher who should be an agricultural college graduate. The expense of this teacher might be properly shared by the State, the village or city maintaining the high school, and the country district from which the pupils were drawn.

The Committee presented in their report a number of tentative schedules for agricultural courses to be incorporated with those already existing in different high schools, in order to show that no violent reorganisation of programme is necessary. Whenever manual arts or natural sciences are introduced into high school courses, the practical effect is to reduce the time given to ancient and modern languages. The programmes submitted, however, leave it open to a student of agriculture to take up at least one ancient or modern language if he wishes.

The Legislature of Minnesota passed an Act in 1905 providing for the establishment and maintenance of County Schools of Agriculture and Domestic Economy, and limiting to £4,000 per annum the amount that any county may appropriate for this purpose, for which two or more counties may unite. Schools are to be under the control of a County School Board of three members. Each school must have with it a tract of land suitable for experiments and demonstration of not less than 10 acres. Tuition is to be free to residents of the county or counties contributing to its support. The State Superintendent of Public Instruction is to have general supervision over the schools and, with the advice of the Dean of the College of Agriculture of the State University, is to prescribe the courses of study.

In Kansas a law of several years' standing provides for the establishment of county high schools by local option. In one of these, that of Norton County, which already gave courses in chemistry, physics, and natural history, it was decided in 1905 to start a regular course in farming, which is the principal industry of the neighbourhood, and a graduate of the Kansas State Agricultural College was engaged to give the instruction required.

Both State and Federal officials were interested in the experiment and assisted in working up public interest in it, with the result, among others, that prizes to the amount of about £23 were offered by farm implement dealers for a grain-judging contest, while three others opened their warehouses in the town to the classes in agriculture and supplied experts to give instruction on the care and use of farm machinery.

The agricultural course includes botany, with special reference to variation, development of species, hybridisation, and the

influence of light, heat, moisture, &c., on the plants, soils and tillage, plant physiology, farm crops, grain judging and horticulture, farm accounts, farm management, methods of cropping, farm machinery and its care, and rural economics with reference to the problems of a business nature to be met with on a farm, animal production and stock judging, and dairying. The course is reported to have become at once a popular one.

Another high school in which a course of agriculture had been recently introduced is situated at Waterford, Pennsylvania. The township of Waterford has a population of about 1,460, of whom half reside in the borough of the same name. The high school is supported and controlled jointly by the borough and the county.

This high school, with three teachers, and three courses (language, scientific and agricultural), has an enrolment of 80 pupils, of whom 35 are in the agricultural course. This course gives five hours a week to agriculture for four years. The work of the first year is devoted to the study of plant life, the second year to the study of field, orchard and garden crops, the third year to domestic animals, dairying and soil physics, and the fourth year to the chemistry of soils and of plant and animal life. Text books are used in the class room and there is a small library of agricultural reference books, reports of the Agricultural Department, &c., which is constantly used. Lectures on agriculture are given by the instructor, who is an agricultural college graduate. The principal feature is the prominence given to laboratory and outdoor work. There is no land attached to the school, but scholars visit farms in the neighbourhood and so obtain practical instruction. Farmers and owners of live stock sometimes bring their animals to the school to be judged by the students, or else allow the latter to come and examine them.

Dr. True gives accounts of various other high schools in different States where agricultural instruction was either being introduced for the first time, or towards which new appropriations were being voted by the State Legislature for the purpose of increasing their efficiency.

In Alabama the Boards of Control of the nine district agricultural schools require each boy to work at least two hours a week on the school farm, and each girl to do practical work in floriculture and kindred subjects.

Primary Schools.

Although any form of agricultural teaching was until quite recently very limited indeed in primary schools, yet Dr. True reports that by June, 1906, the number of schools in the cities and large villages in which nature study formed a part of the course was steadily increasing, and that this movement was spreading to the rural schools. School gardens were being more generally used in connection with such instruction. Much work was being done by the State Departments of Agriculture, Agricultural Colleges, &c., to prepare school teachers for giving elementary instruction of this kind.

Several publications had also been issued from such departments for the purpose of helping teachers of elementary schools.

As an example of what was being done, Dr. True quotes the Farragut School, near Concord, Tennessee. This is a "consolidated" school organised by the consolidation of three school districts. It is supported jointly by the Southern Education Board, which has contributed about £700 sterling, by the State tax levy for teachers' salaries, and by local contributions. The funds raised exclusive of teachers' salaries amount to £1,600, of which £1,200 were spent in buildings.

The building is 54 ft. by 80 ft., two stories high, and contains six well-lighted schoolrooms and a large assembly room. There is also an outbuilding used for domestic science and manual training.

The farm equipment consists mainly of a small poultry house, with incubators and brooder, and a shed for horses. The school has 12½ acres of land, 3 of which are for horticulture, and 6 for farm crops. It is intended to make this a model rural school in which agriculture, domestic science, and manual training predominate. There are five teachers.

The attendance at the school has been considerably greater than that of the three district schools out of which it has grown, and the school promises to become popular.

Instruction in domestic science and agriculture is being given in a simple way, but with real success in about fifty common schools for negroes in and about Norfolk, Virginia. This is paid for out of a special private fund. Instruction is given in woodworking, basket-making, cooking, sewing, and gardening.

School Gardens.

Very interesting work is also being done in school gardens in the great cities. In 1902 a school of this sort was established by Mrs. Henry Parsons in DeWitt Clinton Park, New York City. This park is one of the public playgrounds and is located in a very thickly populated section of the city. The tract allotted to the school comprises 7 acres and includes playgrounds, a running track, a pavilion and pergola, and a farm garden. The pavilion is equipped with shower baths and school rooms for indoor gymnasium and kindergarten exercises. The upper floor is set aside as a recreation place for mothers and small children. The pergola is to be used for children and teachers in connection with the farm garden. Mrs. Parsons secured permission from the Park Commissioner to carry on the farm garden as an experiment at first. It proved successful, and the farm garden became a regular feature of the park work. The Park Department has created the post of Director of Playgrounds and Children's Farm Schools, with a salary of £500 per annum.

The garden area is divided into 458 plots. "Under the supervision of competent teachers, seeds were sown and the little farmers tended their plots from sowing time to the harvest. Several crops were harvested—there being a rotation of farmers as well as of crops—and in all about 2,500 children have enjoyed the advantage afforded by this odd school." The crops grown in 1905 were radishes, peas, beets, carrots, corn, lettuce, and onions. The garden comprises about one acre. Children from fourteen schools worked in the garden and fifteen schools sent visiting classes.

There was also a School of Household Industry for young girls, where more than 500 girls participated in the work during the last three months under report.

Another large school garden exists at Yonkers, near New York City. It comprises 1½ acres of land divided into 240 plots worked by many boys. It is so popular that a waiting list for entry has to be kept. Every boy pays 2 cents a week for seed and instruction, with the view of giving him a special sense of proprietorship in his plot. Each boy has a memorandum book which is kept in the garden, in which he must make an entry each time he visits his plot, so that it becomes a diary

of his work. A practical gardener is in charge, assisted by a voluntary committee of several gardeners.

The City Council of Philadelphia voted £700 in 1904 and 1905 for two public school gardens. The children were selected from a number of schools in the neighbourhood of the school gardens which were divided into several individual and some general plots. About 400 children received instruction in each garden. During the days when there were school hours the children worked in the gardens after school. During the summer vacation they had regularly appointed hours at different times of the day. When they had been taught to hoe, thin, transplant, &c., classes were formed which received lessons in plant life after their work for the day. Vegetables and flowers were grown and materials were furnished for nature study and drawing in the schools. These schools proved extraordinarily popular.

Several gardens were also maintained in the same city by private associations.

Lastly in the city of Cleveland, Ohio, an advanced step in the school garden movement has been made by the appointment of a Curator of School Gardens, who will have charge of the planting and improvement of these institutions throughout the city.

Farmers' Institutes.

No account of agricultural education in this country would be in any sense complete without mention of the farmers' institutes, which have existed for many years in the majority of States. These are organisations for encouraging meetings, lectures, &c., which are held, generally speaking, under the auspices of the State authorities, to which farmers are invited to discuss local agricultural problems, and at which papers are read on various subjects relating to agriculture. The Annual Report on these institutes for 1905, which appears at the end of the Report of the Office of Experiment Stations, states that such institutes existed in every State except Florida, South Dakota and Tennessee. Institutes were held in Florida and Tennessee in previous years, but appear to have been afterwards abandoned. Appropriations varying in amount from £4,000 per annum in New York to £20 per annum in Rhode

Island were voted in every State in which institutes were held, for their development and support.

The number of institutes held and the attendance varied in the same year from 281 institutes with a total audience of 92,593 in Ohio, 196 institutes and audiences of 150,932 in Pennsylvania, to one institute and no attendance in New Mexico. It will thus be seen that the greatest diversity prevails in the different States in regard to the interest taken in these institutes.

The foundation idea and purpose of the farmers' institutes, says Mr. John Hamilton in his Report, is educational. As a means to this end public interest is excited in agricultural affairs by conferences and lectures delivered by experts on agricultural subjects. He states broadly that, while there will probably never be uniformity of system and management throughout all the States, yet there are certain essential features which every State will sooner or later be compelled to adopt in regard to their administration.

First among these is competent central State supervision.

Second, the establishment of a permanent institute organisation for each county, so that there may be always men and women in every county personally interested in the work.

Third, institute organisations should be sufficiently numerous in every county to be easily accessible to all citizens.

Fourth, there should be an adequate supply of competent instructors, and a properly organised system should provide for the education of the teaching force.

At present the Federal Government does not actively assist the institutes, its action in regard to them being limited to investigation and reporting upon them.

Mr. Hamilton suggests that the time has come for the Federal Government to take up the matter further and actively assist the institutes by—

(1) Providing for a corps of lecturers *ad hoc*.

(2) Demonstrating the practicability and value of movable schools of agriculture, which it is suggested should take the place to some extent of the conferences and of the methods hitherto followed by the institutes, as the latter seem to be played out in some of the States.

As an example of the change of interest in certain States,

we may cite New York, whose attendance in 1902–03 was 138,538, in 1903–04 64,347, and in 1904–05 84,739. A good many other States show a falling-off in attendance in the last three years under report.

Mr. Hamilton further suggests that the Department of Agriculture should prepare outlines of courses for the schools referred to above; and that it should prepare and publish sets of illustrated lectures for the use of institute lecturers.

Mr. Hamilton also proposes the establishment of normal inter-state State colleges to provide agricultural teachers in connection with the farmers' institutes.

Having given some description of the objects of these institutes and of their relations to the Federal Government, it will not be out of place to describe somewhat fully their organisation in one or two of the States in which they are most active.

In Pennsylvania, for instance, where the sum of £4,100 was appropriated for their support for the financial year 1904–05, the law on the subject directs that the Deputy Secretary of Agriculture of the State, who is appointed by the Governor of the State for a term of four years, shall be also Director of the Farmers' Institutes. He is required to arrange for the holding of them, and for this purpose to confer with local members of the State Board of Agriculture in every county where such institutes are held, and with representatives duly appointed by the county agricultural, horticultural and other similar organisations. The institutes are supported by biennial appropriations of the State Legislature. The number of institutes held in the year under report in Pennsylvania was 196, of which 44 were one day, 150 two day, and 2 three day meetings.

The local organisation consists of a county chairman, usually a member of the State Board of Agriculture, elected by the County Agricultural Society, and one representative from each of the other county organisations. All expenses of institute work are paid for out of the State appropriations. There were fifty-six lecturers upon the State force.

Besides these publicly organised Institutes, a number of independent ones were held by farmers' clubs, &c., with an attendance of about 30,000.

Another typical farmers' institute organisation is that of the State of Illinois, which is organised under a special Act of the State Legislature and is a public corporation of the State. It consists of three delegates from each county of the State, elected annually at the farmers' institute meetings of the county, and is managed by a Board of Trustees consisting of the State Superintendent of Public Instruction and other State authorities connected with the teaching of agriculture, as well as by delegates elected from each Congressional district. The State Superintendent of Farmers' Institutes, who is one of the officers appointed by the Board, is required by the Act to have general supervision of institute work, to make recommendations as to the line of work to be followed, to visit institute and district conferences, to be responsible for the publication of an annual report, and to arrange its contents, to be librarian of the Institute Free Libraries, and to propose lists of books for purchase by them, and to make a detailed annual report to the Board of his acts and doings during the year, as well as any other reports that the Board may require.

During the year 1904–05, 100 institute meetings were held in Illinois, 50 being two day meetings, while 50 occupied three days or more. There were 114 lecturers on the staff, of which 28 belonged to the Agricultural College and Experiment Station staff. The total attendance was 69,759. An institute was held in every county of the State, and the total cost amounted to about £3,851. The local organisations elect their own officers and formulate their own rules, and are permitted to select their own speakers and to choose such topics for discussion as they believe will be of interest to their respective localities.

The Illinois Farmers' Institute is authorised to award one free scholarship in the College of Agriculture, tenable for two years, for each county in the State, and one for each congressional district of Chicago.

Free circulating libraries are distributed among the several county institutes; 51 of these libraries have been equipped and sent out, containing each about 50 volumes.

A new feature of the work in Illinois has been the combination of teachers and farmers' institutes. The teaching of agriculture in the public schools and the consolidation of rural schools were discussed at every institute throughout the State.

The Illinois Farmers' Institute is required to make an annual report to the Governor of its transactions.

Further details are given in the Reports on Farmers' Institutes, published in the Annual Reports of the Office of Experiment Stations for the years 1905 and 1906.

Report of Secretary of Agriculture for 1906–07.

The Report of the Secretary of Agriculture for the year ending 30th June, 1907, was received too late to make its contents part of the general basis of this report. It has, however, been referred to more than once, and the following is a short summary of the parts specially devoted to agricultural education.

Mr. Wilson states that in response to numerous demands, the work of his department in regard to agricultural education has been gradually broadened until it now touches nearly every phase of the subject. The Department, through the Office of Experiment Stations, has been active in aiding the establishment of agricultural high schools and the introduction of agricultural subjects into the curricula of the public schools.

Representatives of the Agricultural Office have addressed meetings in various States, have given advice regarding legislation and courses of study, have visited various agricultural colleges, and held conferences with their teachers. A special study has been made of agricultural education for negroes.

The most important lines of educational effort in which the Department should engage are outlined by the Secretary as follows :—

(1) To aid the agricultural colleges to reduce the result of the investigations made by the Department and the Experiment Stations to pedagogical form for use in agricultural colleges and schools of different grades.

(2) To promote the efficiency of agricultural instruction in the negro land grant colleges, in order that the funds granted for negro education by the Federal Government may contribute towards keeping the negro on the farm.

(3) To aid the agricultural organisations in the several States in promoting an efficient organisation of public high schools, consolidated common schools, and other educational agencies best adapted to secure a high state of prosperity and contentment in rural life.

It is along these lines that the great educational effort of the immediate future is to be made.

(4) Since the success of the agricultural instruction in the public schools will depend very largely on the teachers, the Department should aid the agricultural colleges and other State educational institutions in preparing and inaugurating training courses for teachers of agriculture in secondary and elementary schools.

(5) Since agriculture as a fundamental industry is of vital importance to all our people, the Department should present such results of its work and of the work of the experiment stations at home and abroad as are adapted to instructional purposes in connection with nature study and elementary agriculture, in a form available to teachers and pupils in both country and city, the object being to impress our youth with the dignity, value, and attractiveness of country life and pursuits.

A mass of information on the various activities of the Department of Agriculture, which are not directly classifiable under the head of agricultural education, is also contained in the report of the Secretary. Among these may be specially noticed, the search by agricultural explorers in foreign lands for new crops at the instigation of the Bureau of Plant Industry. This has resulted in the discovery and introduction of several new and very promising varieties.

The Department has also conducted a "campaign of education" in the matter of seed supplied to farmers by testing, for farmers and seedsmen, hundreds of samples of seeds and encouraging good seed work by means of addresses at farmers' institutes and other meetings. Fruit marketing, transportation, and storage have been the object of special and interesting investigation, and great progress is reported to have been made in developing new crops by means of selection. By this means a large variety of improved fruits and cereals is stated to have been obtained.

All this work has been carried on by the various Bureaux of the Department, working in connection with the experiment stations originally founded under the Hatch Act of 1887, for which largely increased grants have since been voted by Congress, until by present arrangements each State will receive from Congress in 1911 and onwards £6,000 sterling annually for their maintenance.

The Secretary of Agriculture, speaking of these stations, said: "The State Experiment Stations have already performed service of great value. They have done much to secure radical and widespread improvement in agricultural practice; they have contributed in large measure to the creation of a new American literature of agriculture and made it available to every farmer; they have collected much of the material from which the science of agriculture is being formulated as the basis for instruction of successive generations of farmers in colleges, schools, and farmers' institutes. As their work has developed, it has naturally divided itself into broad classes, which may be briefly summarised as (1) Original research; (2) verification and demonstration of experiments, often of a local character and import; (3) inspection service, and (4) dissemination of information.

"So great has been the local pressure for work of the last three classes that by far the greatest share of the national and State funds has been spent in these lines."

It has not been possible within the limits of this report to give a detailed account of the workings of agricultural education in the different States or of the laws which the State Legislatures have passed in regard to this subject. The object of the writer has rather been as far as possible, while entering into some detail in regard to certain typical institutions, to give a general bird's eye view of the position of such education throughout the whole country, of the activities of the Federal Department of Agriculture in connection therewith, and of the general trend of public opinion in regard to the question.

The impression left in the mind of an inquirer into the subject is that while much has been done all over the Union since the Act of 1862 for the development of higher collegiate instruction, secondary and primary agricultural education is still practically in its infancy. On all sides, however, there are evidences that this state of things will not be allowed to continue much longer. The desertion of the land in some parts of the Union, especially in the New England States, where many farms have actually been left derelict or are being bought up and converted into large estates for other than agricultural purposes, is causing considerable anxiety to statesmen. One of the main remedies proposed, though by no means the only

one, is the spread of agricultural education, so that the rural schools shall no longer, as stated by Dr. Maxwell, Superintendent of Schools of New York City, in a speech already quoted in this report, teach only matter which "seemed most necessary for the success of the pupils when they should move to the city," thus tending to bring up boys and girls in the country to be ignorant of and to despise country things.

There are other things, it is true, against which agriculture in this country, as in others, must contend: such as the scarcity and cost of labour, the small hope that agriculture holds out to those that embrace it of a brilliant or highly successful career or of the amassing of a large fortune, and the want of those social amusements and distractions which fall to the lot of the townsman.

But there is certainly a general conviction growing that much may be done to stem the cityward tide by a system of agricultural education, not only technical but also social and ethical, which both interests its scholars in the science of agricultural industry, and at the same time teaches them that by abandoning the country for the town they are frequently giving up the better part in life at the instigation of unattainable ambitions, and thereby sacrificing the substance for the shadow.

That President Roosevelt has this problem at heart as much as any man in the United States, no one who has read his recent utterances can doubt.

On 31st May last, he spoke at the semi-centennial celebration of the founding of the Michigan Agricultural College, and dwelt at considerable length on the fact that the American school system has been "well-nigh wholly lacking hitherto on the side of industrial training, of the training which fits a man for the shop and the farm." He pointed out that in this respect educational energies had been devoted rather to produce high-grade men at the top than skilled workmen in the ranks of the industrial professions. The result of this was, he said, that "in many of our trades almost all the recruits among the workmen are foreigners."

Referring to the social and ethical phase of the question of education, the President strongly advocated the necessity for social coherence and a sense of community interest, the gradual disappearance of which in the Eastern States he deplored.

"In such communities the country church, for instance, has gone backward, both as a social and religious factor. Now we cannot too strongly insist upon the fact that it is quite as unfortunate to have any social as any economic falling-off. . . . Everything should be done to encourage the growth in the open farming country of such institutional and social movements as will meet the demands of the best type of farmers. There should be libraries, assembly halls, social organisations of all kinds. The school building, and the teacher in the school building, should throughout the country district be of the very highest type, able to fit the boys and girls, not merely to live in, but thoroughly to enjoy and make the most of the country."

In addition to this, the President emphasised the vital necessity for farmers to co-operate with each other and with the Government.

Enough has been quoted from this speech by Mr. Roosevelt to show how great an importance he attaches to the extension of an agricultural education of a new type. This is to teach agriculture, not only from an industrial, scientific, and economic point of view, but to take a broader line as well and to appeal to the ethical and social instincts of man, in other words, to use the President's own phrase, "To fit boys and girls not merely to live in, but thoroughly to enjoy and make the most of the country."

America has already in her agricultural colleges and experiment stations splendid institutions for the formation of the agricultural teachers required for this wider development of agricultural education. It may well be hoped that, starting from such a point of vantage and running on the lines indicated in the President's speech, the new movement will be successful in achieving the object it has in view.

APPENDIX No. I.

Summary of Laws Passed since 1905 with Regard to Agricultural Education.

Elementary Agriculture.

Laws were passed in 1905 by Massachusetts, which authorised the Agricultural College to establish a normal department for the

instruction of teachers in the elements of agriculture (Chapter 505, 20th June, 1906, 24th May, 1905), and in 1905 by Minnesota, New Jersey, and Wisconsin.

Minnesota provided for the establishment, organisation and maintenance of county schools of agriculture and domestic science. Such schools are to be established by County Commissioners upon vote by electors of the county. Two or more counties may unite for the purpose. Maximum annual State grant, £4,000. The Act also creates a County School Board for control and provides for State aid (Chapter 55, March 25th, 1905).

New Jersey (Chapter 55, 25th March, 1905) provided for short courses in practical and scientific agriculture in the State Agricultural College, and made a general appropriation of £4,800 for initial establishment and an annual appropriation of £1,300 for maintenance.

Wisconsin (Chapter 158, 3rd May, 1905,) provided for the teaching of the elements of agriculture in district schools.

Farmers' Institutes.

In 1905, California appropriated £2,400 to the University of California for the purpose of holding farmers' institutes (Chapter 251, 18th March, 1905). Nebraska authorised County Commissioners to expend £20 per annum for local expenses in connection with farmers' institutes (Chapter 3, 5th March, 1905). North Dakota authorised the increase of farmers' institutes from 40 to 50, decreasing grant from £1,600 to £1,200 annually (Chapter 23, 15th March, 1905). Ohio amended the law passed in 1890 relating to payment of expenses of farmers' institutes, 2nd April, 1906).

Oregon authorised an annual grant of £5,000 for agricultural institutes at the State Agricultural College (Chapter 34, 26th February, 1905). South Dakota authorised expenditure by counties of £40 per annum for expenses of annual meeting of farmers' institutes (Chapter 109, 3rd March, 1905) and also authorised an annual State grant of £1,000 for farmers' institutes.

Grants, &c., for Agricultural Education.

In 1905, Colorado appropriated the sum of £6,000 for the purpose of extending the course of instruction at the

State Agricultural College and the work of the Experiment Station during 1905–06 (Chapter 30, 6th April, 1905).

Connecticut amended a Law of 1903 relating to the income of the fund of the Agricultural College and fixed the interest payable by the State at 5 per cent. (Chapter 74, 18th May, 1905).

Idaho created and established an Agricultural College Fund.

In 1906, Iowa provided for a levy of a special tax of one-fifth of a mill on the dollar upon the assessed valuation of taxable property for the State, for the erection, repair, improvement, and equipment of buildings for the State College of Agriculture and the Mechanic Arts, to be levied annually for five years, beginning 1907 (Chapter 184, 10th April, 1906).

Kansas appropriated funds for the support of the State Agricultural College, and fixed the fees to be paid by the students (Chapter 17, 7th March, 1905).

Kansas also passed measures relating to the investment, &c., of the Agricultural College Fund in the same year.

Kentucky allotted in 1906 to the use of the Agricultural and Mechanical College one-half of one cent out of the annual tax of 50 cents on each $100 of value of all property directed to be assessed for taxation.

Rhode Island in 1906 increased its annual appropriation for the Agricultural and Mechanical College from £3,000 to £5,000.

Utah in March, 1905, created a Commission to consider the advisability of submitting to the electors a constitutional amendment providing for the consolidation of the Agricultural College with the University of Utah, and in the same month passed an Act prohibiting the University from giving any instruction except in the normal courses in any branches of agriculture.

State Laws as to Agricultural Colleges.

On May 1st, 1905, Arkansas passed an Act extending the usefulness and development of the Arkansas Agricultural Experiment Station in agriculture, horticulture, veterinary entomology, and kindred subjects, making appropriations for the improvement and maintenance of the same, and establishing courses of instruction at the State University branch experiment stations, and agricultural investigations (Act No. 231, 1st May, 1905).

Iowa on 10th April, 1905, authorised the State College of

Agriculture and Mechanic Arts to undertake and maintain a system of agricultural extension work, courses of instruction and experimental work throughout the State, and appropriated £3,000 for this purpose (Chapter 185, 10th April, 1905).

Minnesota (Chapter 132, 11th April, 1905) established a branch School of Agriculture at Crookston, as a department of the University of Minnesota.

New Jersey (Chapter 90, 31st March, 1905) modified the number of students to be selected as scholars at the Agricultural College, and provided for an annual payment by the State to the College of £24 for each scholarship, the total grant not to exceed £3,000.

New York (Chapter 218, 12th April, 1906) provided for the administration of the New York State College of Agriculture at Cornell University, and outlined the scope of instruction to be given.

New York established a New York State School of Agriculture at the Saint Lawrence University, and appropriated £16,000 for erecting and equipping a suitable building, and prescribed objects and purposes of the School, and powers and duties of the Board of Trustees.

Pennsylvania (Act No. 35, 24th March, 1905) increased the membership of the Board of Trustees of the Pennsylvania State College by nine members, of whom five were to be *ex-officio*. Among these five are the President of the State Agricultural Society and the Secretary of State Board of Agriculture.

Utah (Chapter 134, 20th March, 1905) amended its Statutes relating to courses of instruction in the Agricultural College, prohibiting it from offering courses in engineering, liberal arts, pedagogy, law, or medicine.

Washington (Chapter 53, 2nd March, 1905) changed the name of the Washington Agricultural College to the State College of Washington.

Wyoming (Chapter 10, 7th February, 1905) repealed Chapter 92 of the Act of 1890 relating to the establishment, government and maintenance of the Wyoming Agricultural College.

APPENDIX No. II.

The following is a memorandum containing the latest account obtainable of State Legislation respecting agricultural education for the year 1907.

While only two of the measures mentioned in the memorandum were reported as having actually become law at the date, 15th June, on which it was written, it is probable that several have since been approved.

The number of Bills on the subject which have been submitted to various State Legislatures in the course of this year is a proof of the widespread interest in the advancement of agricultural education throughout the country.

Memorandum in regard to Legislation on behalf of Education in Agriculture by the State Legislatures in 1907.

Arkansas.—A Bill to provide for an agricultural and horticultural school was passed by the House and Senate, but was vetoed by the Governor.

A Bill to authorise the teaching of elementary agriculture in the public schools was passed by the House and Senate.

A Bill to divide the State into four districts, in each of which should be established a State Agricultural School, was introduced in the House.

A Bill to provide for the establishment of branch agricultural stations in the several counties was introduced in the Senate.

A Bill to provide for the establishment and maintenance of agricultural and horticultural schools was introduced in the Senate.

California.—A Bill providing for courses of study in agriculture and domestic science in high schools passed the House and Senate.

A Bill to appropriate $10,000 for the establishment of a School of Forestry at the University of California passed the House and Senate.

Florida.—A Bill to provide for the establishment of

agricultural schools in the different Congressional districts was introduced, but failed in the House, 27th April, 1907.

Illinois.—A Bill to establish a department of forestry in the University of Illinois was introduced in both Houses.

Indiana.—Two Bills providing for the establishment of county agricultural and domestic science schools were introduced in the House.

A Bill authorising La Porte County to establish an agricultural and domestic science school passed both Houses, but was vetoed by the Governor.

Iowa.—A Bill appropriating $50,000 annually for agricultural extension and for a correspondence school of agriculture passed the House, 20th March, 1907.

A Bill to establish four agricultural and industrial high schools failed in the House, 1st April, 1907.

A Bill to establish an agricultural and manual training school was introduced in the House.

A Bill to establish an agricultural and manual training school at Red Oak was introduced in the Senate.

Michigan.—A Bill to provide for courses of study in agriculture and domestic science and art and manual training in certain school districts was introduced in the House.

A Bill to provide for the establishment of county schools of agriculture and domestic economy passed both Houses and was signed by the Governor, 3rd April, 1907.

Minnesota.—A Bill to establish agricultural high schools and branch experiment stations failed in the Senate, 17th April, 1907.

A Bill to establish county schools of agriculture passed the House, 28th March, 1907.

A Bill to provide for the establishment of an additional sub-experiment farm and agricultural school within the territory of Lincoln, Lyon, and Yellow Medicine Counties was introduced in the House.

A Bill providing for the establishment of county schools of agriculture, industrial science, and manual training for school teachers was introduced in the Senate.

A Bill establishing nine agricultural schools and experiment stations was introduced in the House.

Two Bills to encourage education in agriculture and domestic science in county schools were introduced.

A Bill to establish an agricultural school in the south-eastern part of the State was passed by the Senate.

A Bill to establish county schools of agriculture and domestic science was introduced in the Senate.

A Bill to aid the establishment of rural agricultural schools was introduced in the House.

Texas.—A Bill providing for the introduction for use in the public schools of text-books on the rudiments of agriculture passed the House, 10th April, 1907.

A Bill providing for the teaching of the elements of agriculture passed the House and Senate.

A Bill to amend the general laws of the Twenty-ninth Legislature, so as to provide for the teaching of agriculture in the public schools, was introduced in the House.

Utah.—A Bill providing for instruction in agriculture and manual training in the higher grades in the public schools passed the House and Senate.

Wisconsin.—A Bill authorising any village to bear a part of the cost of county schools of agriculture and domestic economy passed both Houses, and was signed by the Governor, 21st March, 1907.

A Bill relating to the number of schools of agriculture and domestic economy that may be established was introduced in the Senate.

LONDON:
Printed for His Majesty's Stationery Office,
By HARRISON AND SONS,
Printers in Ordinary to His Majesty.
(2,500 1 | 08—H & S 2427)

Vol. XIV. PUBLISHED MONTHLY. No. 1.

The Journal
OF THE
BOARD OF AGRICULTURE

APRIL, 1907.

CONTENTS.

LONDON:
PRINTED FOR HIS MAJESTY'S STATIONERY OFFICE
BY HARRISON & SONS, ST. MARTIN'S LANE, LONDON, W.C.,
AND PUBLISHED BY THE BOARD OF AGRICULTURE AND FISHERIES.

MONTHLY.
[PRICE FOURPENCE.]

6

FEEDS FOR ONE PENNY

Makes **CATTLE** Quick Growers.
Keeps **HORSES** Healthy and Strong.

INTERNATIONAL

Fattens **SHEEP** in 30 Days' Less Time.
As a **PIG** Fattener it is Wonderful.

STOCK FOOD

Prices: **1/-** packet, post paid **1/4**; **2/-** packet, post paid **2/6**; **4/-** packet, post paid **4/7**; in pails, **14/-** carriage paid. Poultry Food Prices same as for Stock Food. Prices for Veterinary Preparations and Poultry Remedies on application.

F. C. SOUTHWELL & Co., Ld., 75, Southwark St., London, *or their Local Agents.*

Approved by the Board of Agriculture & Fisheries for SHEEP SCAB in Great Britain in the proportions as shown on Directions for use.

LITTLE'S *Sheep Dips*

THE MOST RELIABLE & BEST FOR THE WOOL.

SOLD EVERYWHERE

OF ALL CHEMISTS AND MERCHANTS,

OR DIRECT FROM

MORRIS, LITTLE & SON, LTD., DONCASTER.

Vol. XIV. PUBLISHED MONTHLY. No. 2.

The Journal
OF THE
BOARD OF AGRICULTURE

MAY, 1907.

CONTENTS.

LONDON:
PRINTED FOR HIS MAJESTY'S STATIONERY OFFICE
BY HARRISON & SONS, ST. MARTIN'S LANE, LONDON, W.C.,
AND PUBLISHED BY THE BOARD OF AGRICULTURE AND FISHERIES.

MONTHLY.
[PRICE FOURPENCE.]

Vol. XIV. PUBLISHED MONTHLY. No. 3.

The Journal OF THE BOARD OF AGRICULTURE

JUNE, 1907.

CONTENTS.

LONDON:
PRINTED FOR HIS MAJESTY'S STATIONERY OFFICE
BY HARRISON & SONS, ST. MARTIN'S LANE, LONDON, W.C.,
AND PUBLISHED BY THE BOARD OF AGRICULTURE AND FISHERIES.

MONTHLY.
[PRICE FOURPENCE.]

Vol. XIV. PUBLISHED MONTHLY. No. 4.

The Journal
OF THE
BOARD OF AGRICULTURE

JULY, 1907.

CONTENTS.

LONDON:
PRINTED FOR HIS MAJESTY'S STATIONERY OFFICE
BY HARRISON & SONS, ST. MARTIN'S LANE, LONDON, W.C.,
AND PUBLISHED BY THE BOARD OF AGRICULTURE AND FISHERIES.

MONTHLY.
[PRICE FOURPENCE.]

Vol. XIV. PUBLISHED MONTHLY. No. 5.

The Journal OF THE BOARD OF AGRICULTURE

AUGUST, 1907.

CONTENTS.

LONDON:
PRINTED FOR HIS MAJESTY'S STATIONERY OFFICE
BY HARRISON & SONS, ST. MARTIN'S LANE, LONDON, W.C.,
AND PUBLISHED BY THE BOARD OF AGRICULTURE AND FISHERIES.

MONTHLY.
[PRICE FOURPENCE.]

Vol. XIV. PUBLISHED MONTHLY. No. 6.

The Journal
OF THE
BOARD OF AGRICULTURE

SEPTEMBER, 1907.

CONTENTS.

LONDON
PRINTED FOR HIS MAJESTY'S STATIONERY OFFICE
By HARRISON & SONS, St. Martin's Lane, London, W.C.,
and PUBLISHED by the BOARD OF AGRICULTURE AND FISHERIES

MONTHLY.
[PRICE FOURPENCE.]

Vol. XIV. PUBLISHED MONTHLY. No. 7.

The Journal
OF THE
BOARD OF AGRICULTURE

OCTOBER, 1907.

CONTENTS.

LONDON
PRINTED FOR HIS MAJESTY'S STATIONERY OFFICE
BY HARRISON & SONS, ST. MARTIN'S LANE, LONDON, W.C.,
AND PUBLISHED BY THE BOARD OF AGRICULTURE AND FISHERIES

MONTHLY.
[PRICE FOURPENCE.]

Vol. XIV. PUBLISHED MONTHLY. No. 8.

The Journal
OF THE
BOARD OF AGRICULTURE

NOVEMBER, 1907.

CONTENTS.

LONDON
PRINTED FOR HIS MAJESTY'S STATIONERY OFFICE
BY HARRISON & SONS, ST. MARTIN'S LANE, LONDON, W.C.,
AND PUBLISHED BY THE BOARD OF AGRICULTURE AND FISHERIES.

MONTHLY.
[PRICE FOURPENCE.]

Vol. XIV. PUBLISHED MONTHLY. No. 9.

The Journal
OF THE
BOARD OF AGRICULTURE

DECEMBER, 1907.

CONTENTS.

LONDON:
PRINTED FOR HIS MAJESTY'S STATIONERY OFFICE
BY HARRISON & SONS, ST. MARTIN'S LANE, LONDON, W.C.,
AND PUBLISHED BY THE BOARD OF AGRICULTURE AND FISHERIES.

MONTHLY.
[PRICE FOURPENCE.]

Vol. XIV. PUBLISHED MONTHLY. No. 10.

The Journal
OF THE
BOARD OF AGRICULTURE

JANUARY, 1908.

CONTENTS.

LONDON:
PRINTED FOR HIS MAJESTY'S STATIONERY OFFICE
BY HARRISON & SONS, ST. MARTIN'S LANE, LONDON, W.C.,
AND PUBLISHED BY THE BOARD OF AGRICULTURE AND FISHERIES.

MONTHLY.
[PRICE FOURPENCE.]

Vol. XIV. PUBLISHED MONTHLY. No. 11.

The Journal OF THE BOARD OF AGRICULTURE

FEBRUARY, 1908.

CONTENTS.

LONDON
PRINTED FOR HIS MAJESTY'S STATIONERY OFFICE
BY HARRISON & SONS, ST. MARTIN'S LANE, LONDON, W.C.,
AND PUBLISHED BY THE BOARD OF AGRICULTURE AND FISHERIES.

MONTHLY.
[PRICE FOURPENCE.]

Vol. XIV. PUBLISHED MONTHLY. No. 12.

The Journal
OF THE
BOARD OF AGRICULTURE

MARCH, 1908.

CONTENTS.

LONDON
PRINTED FOR HIS MAJESTY'S STATIONERY OFFICE
BY HARRISON & SONS, ST. MARTIN'S LANE, LONDON, W.C.,
AND PUBLISHED BY THE BOARD OF AGRICULTURE AND FISHERIES.

MONTHLY.
[PRICE FOURPENCE.]

Supplement

TO

The Journal

OF THE

BOARD OF AGRICULTURE.

VOL. XIV. No. 10. JANUARY, 1908.

REPORT

ON

AGRICULTURAL EDUCATION

IN THE

UNITED STATES.

LONDON
PRINTED FOR HIS MAJESTY'S STATIONERY OFFICE,
BY HARRISON & SONS, ST. MARTIN'S LANE, LONDON, W.C.
AND PUBLISHED BY THE BOARD OF AGRICULTURE AND FISHERIES.

PRICE FOURPENCE.
POST FREE.

PRICE TO SUBSCRIBERS TO THE JOURNAL,
THREEPENCE.

PUBLICATIONS OF THE BOARD OF AGRICULTURE AND FISHERIES.

Annual Reports and other Publications presented to Parliament.—A complete list of these publications and of the leaflets can be obtained on application to the Secretary, Board of Agriculture and Fisheries, 4, Whitehall Place, London, S.W.

The following is a list of recent publications which are to be purchased through any Bookseller, or directly from any of the following Agents, viz.:—

WYMAN & SONS, LTD., FETTER LANE, FLEET STREET, E.C.; OLIVER & BOYD, EDINBURGH; or E. PONSONBY, 116, GRAFTON STREET, DUBLIN.

Title of Publication.	Price.	Parliamentary Number.
	s. d.	
Annual Reports—		
Agricultural Statistics, Part I (Acreage and Live Stock) 1906	0 5	Cd. 3281
Agricultural Statistics, Part II, (Produce of Crops) ... 1906	0 5	Cd. 3372
Do. Part III (Prices and Supplies) 1906	0 8½	Cd. 3653
Do. Part IV (Colonial and Foreign Statistics) 1906	0 5½	Cd. 3832
Proceedings under the Diseases of Animals Acts ... 1906	1 0	Cd. 3415
Proceedings under Tithe, Copyhold, and other Acts ... 1906	0 2½	Cd. 3504
Distribution of Grants for Agricultural Education 1905–1906	0 10	Cd. 3317
Progress of the Ordnance Survey 1906–1907	3 9	Cd. 3668
Proceedings under the Sale of Food and Drugs Acts, and other Acts 1906	0 7	Cd. 3869
Proceedings under the Salmon and Freshwater Fisheries Acts, &c. 1906	0 5½	Cd. 3673
Proceedings under Acts relating to Sea Fisheries ... 1905	1 1	Cd. 3104
Other Publications—		
Report on Decline in the Agricultural Population 1881–1906	0 8	Cd. 3273
Report on the Production of Wool in Great Britain 1905–1906	0 4	—

A Return of Market Prices of Fat and Store Stock, Dairy Cattle, Meat, Provisions, Fruit, Vegetables, Hay and Straw at certain representative Markets in Great Britain is issued *every Saturday* containing Reports of Markets up to the preceding Thursday.

Price *One Penny* per copy, to be obtained through any bookseller, or directly from the publishers named above.

A copy will be sent regularly as issued, by the publishers, for three, six, or twelve months, on payment of a subscription, including postage, at the rate of 6*s.* 6*d.* per annum.

Diagrams of Diseases of Trees and Plants.—With a view to the dissemination of information as to fungus pests of fruit and forest trees and plants, the Board of Agriculture and Fisheries have issued two series of coloured diagrams, prepared under the supervision of the Director of the Royal Botanic Gardens, Kew, illustrating some of the commoner diseases attacking trees and plants in this country.

Diagrams of Diseases of Forest Trees.—These diagrams, which are suitable for lecture rooms, museums, schools, &c., are contained in nine sheets, 21 ins. by 15 ins., and may be obtained from the publishers named above; price 1*s.* each sheet, or by post 1*s.* 3*d.*, or the set, post free, for 9*s.* 5*d.*

Diagrams of Diseases of Fruit and Fruit-bearing Plants.—These diagrams are contained in seven sheets and can be obtained *only* at the Offices of the Board of Agriculture and Fisheries, 4, Whitehall Place, London, S.W., price 1*s.* per sheet of 6*s.* 6*d.* per set of seven sheets, post free.